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Massachusetts Military Reservation

PLUME RESPONSE PROGRAM

Final
Engineering Evaluation, Cost Analysis, and Execution Plan for Coonamessett River FS-28 Bog Separation Project

November 1998

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AFCEE/MMR
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ACRONYMS AND ABBREVIATIONS

AFCEE	Air Force Center for Environmental Excellence
AM	action memorandum
AOC	area of contamination
ARAR	applicable or relevant and appropriate requirement
ASG	Automated Sciences Group
AT	averaging time
AVS/SEM	acid volatile sulfide / simultaneously extracted metals
AWQC	ambient water quality criteria
BW	body weight
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CF_1	conversion factor 1 (mg to µg)
CF_2	conversion factor 2 (cm^3 to L)
CFR	Code of Federal Regulations
cfs	cubic feet per second
cm/hr	centimeters per hour
CMR	Code of Massachusetts Regulations
CS-4	Chemical Spill No. 4
CSF	cancer slope factor
CWA	Clean Water Act
CWSW	Coonamessett Water Supply Well
DEP	Massachusetts Department of Environmental Protection
DERP	Defense Environmental Restoration Program
DPH	Massachusetts Department of Public Health

ACRONYMS AND ABBREVIATIONS

DOC	dissolved organic carbon
DOD	Department of Defense
ED	exposure duration (to surface water)
EDB	ethylene dibromide
EF	exposure frequency (to surface water)
EPA	U.S. Environmental Protection Agency
ESP	Ecological Sampling Plan
ET	exposure time (to surface water)
ETD	extraction, treatment, and discharge
ETR	extraction, treatment and reinjection
EW	extraction well
FD&CA	Food, Drug, and Cosmetic Act
FFA	Federal Facilities Agreement
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act
FS-28	Fuel Spill No. 28
ft/day	feet per day
GAC	granular activated carbon
GC/MS	gas chromatograph/mass spectrometer
gpm	gallons per minute
HDPE	high-density polyethylene
HWMR	Hazardous Waste Management Regulations
IR_i	inhalation rate
IR_w	surface water ingestion rate
IRP	Installation Restoration Program
m^3/kg	cubic meters per kilogram

ACRONYMS AND ABBREVIATIONS

MADFW	Massachusetts Division of Fisheries and Wildlife
MCL	maximum contaminant level
MDL	method detection limit
mgd	million gallons per day
MGL	Massachusetts General Law
mL/hr	milliliters per hour
MMR	Massachusetts Military Reservation
MOA	memorandum of agreement
MSL	mean sea level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ng/m^3	nanograms per cubic meter
NHESP	National Heritage and Endangered Species Program
NOI	notice of intent
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List (Superfund)
PC	dermal permeability factor
ppbv	parts per billion volume
PQL	practical quantitation limit
PRP	potentially responsible party
QC	quality control
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RDA	Request for Determination of Applicability
REC	risk equivalent concentration
RfD	reference dose

ACRONYMS AND ABBREVIATIONS

RI/FS	Remedial Investigation/ Feasibility Study
RL	reporting limit
ROD	Record of decision
SA	skin surface area
SDWA	Safe Drinking Water Act
SF_d	dermal slope factor
SF_i	inhalation slope factor
SF_o	oral slope factor
SIM	selective ion mode
SVOC	semi-volatile organic compound
SWOU	Southwest Operable Unit
TAT	turnaround time
TCE	trichloroethylene
TCLP	Toxicity Characteristic Leaching Procedure
TKN	total Kjeldahl nitrogen
TOC	total organic carbon
TR	target risk
TSD	treatment, storage, disposal
USACE	United States Army Corps of Engineers
USC	United States Code
USGS	U.S. Geological Survey
VF	volatilization factor
VFD	variable frequency driver
VOCs	volatile organic compounds
µg/L	micrograms per liter

EXECUTIVE SUMMARY

As part of its Plume Response Program the Air Force Center for Environmental Excellence has proposed a removal action on the Coonamessett River. Ethylene dibromide (EDB) has been found in groundwater and surface water concentrations exceeding federal and state drinking water standards. There are concerns about potential adverse impacts on the health and well being of nearby residents and about impacts on adjacent cranberry crops. The purpose of the proposed remedial action is to:

- Protect human health by reducing exposure to EDB occurring in surface water, groundwater, and cranberry crops, while minimizing impacts to ecological systems.
- Accelerate the restoration of the Coonamessett River.

The preferred removal action alternative would consist of either constructing earthen berms or installing vinyl sheet piling to separate the contaminated surface water from the cranberry bogs, collecting contaminated surface and groundwater, actively treating the contaminated water to reduce the concentration of EDB, and installing a pipeline to convey treated water to the active cranberry operations. The preferred alternative was advanced in this document to begin to secure permits for the removal action.

PROPOSED ACTION

The preferred removal action on the Coonamessett River involves supplying alternative sources of water to all upper bogs for flooding and harvesting, including those already isolated from the river (the Augusta, West Thompson, and Chaston bogs), separating the remaining upper bogs from the river (Baptiste E3, Adams, Lassalle and East Thompson bogs), and providing active treatment of shallow groundwater. The existing treatment system may need expansion to effectively reduce concentrations of EDB in the river system.

Alternative Water

Waters in which the cranberry vines reside must have non-detectable concentrations of EDB. An alternate source of clean water would be provided to replace the river water currently being used for crop activities such as winter flooding and harvesting. The FS-28 Treatment Plant associated with Extraction Well (EW-1) would be the alternate water source. A pipeline transmitting the treated water from the existing EW-1 treatment plant would be buried in existing bog roads crossing properties owned by the Town of Falmouth and private individuals. The proposed pipeline would be approximately 4000 feet in length with a corridor width of 25 feet (2.3 acres).

At the current discharge rate (600 gpm) the bogs will require approximately nine days to have two feet of water over the vines. If the treatment plant were expanded, the discharge rate would be approximately 1400 gpm and the time decreases to four days. The bog growers have indicated that 3 to 4 days is acceptable to fill the bogs. If the treatment plant is not expanded, a holding pond would be constructed on the Augusta bog to maintain the time to approximately four days. Water in the holding pond would be stored as needed and used to fill the Augusta and West Thompson bogs.

Separation

Earthen berms or sheet piling would be constructed or installed on the existing bogs to separate active bogs from the river. Separation of the bogs from the Coonamessett River is required in four locations: Upper Baptiste E3, Adams, Lasalle, and East Thompson bogs.

Active Treatment

The active treatment portion of this remedial action would entail extracting shallow groundwater from the upper portion of the Lower Baptiste bog. The full-scale well-point extraction system would consist of approximately 168 well points and be constructed over an area of approximately 1-acre. Extracted groundwater would be

piped to an expanded EW-1 treatment plant. The pipeline will be approximately 2500 feet in length and installed within a 25 foot wide corridor.

Power for the shallow well-point extraction system would be brought in from Hunky Dory Farm Road to a new access road. The road improvement is approximately 1200 feet by 40 feet. The road would be constructed in uplands owned by a private party. A pump house (10 feet by 20 feet) would house the electrical service and pumping equipment. The existing treatment plant occupies an area of 25 feet by 40 feet. Because of the additional 1000 to 1800 gpm treatment requirements, the treatment plant would be expanded to include another building with the dimension of 30 feet by 40 feet. This expansion will require an area of 100 feet by 200 feet for use during construction and for long term access to the site. Adding another building and treatment facility would only occur if the shallow wells points in the lower Baptiste bog require more than 350 gpm to achieve the removal action objectives.

If non-detect is attained in the surface water at the inlet to Pond 14, no additional action is required for the bogs below Pond 14. However, improvements to the outlets of Pond 14 and Flax Pond would be included to improve the fish migration pathway.

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1.0 PROBLEM STATEMENT

1.1 INTRODUCTION

This report presents the proposed efforts to further address ethylene dibromide (EDB) contamination found upwelling in the Coonamessett River in Falmouth, MA. In 1997, the Air Force Center For Environmental Excellence (AFCEE) installed a groundwater extraction, treatment, and discharge system to intercept and treat the highest levels of ethylene dibromide (EDB) contamination found in the Fuel Spill 28 groundwater plume. However, a portion of the EDB plume could not be captured with this system and the river remains affected by elevated levels of EDB.

EDB has been found in concentrations that exceed federal and state drinking water standards and, as a result, an alternative drinking water supply was provided for residents within or adjacent to the contaminated groundwater plume.

Now, the primary concern with EDB contamination is associated with the cranberry growing operations along the Coonamessett River. The cranberry growers depend upon water from the river for freeze protection and harvesting of their crop. EDB in any concentration is unacceptable to the cranberry growers because any level of chemical contamination in contact with the crop causes their berries to be unmarketable.

1.2 PROJECT PURPOSE

The purpose of this continued removal action is to:

- Protect human health by reducing exposure to EDB occurring in surface water, groundwater, and cranberry crops while minimizing impacts to ecological systems.
- Accelerate the restoration of the Coonamessett River.

1.3 PROJECT OBJECTIVES

The objectives of the project are as follows:

- If technically and economically feasible, protect human health by reducing concentrations of EDB to non-detect in surface water within the project area.
- Protect existing cranberry operations and decrease the risk of crop contamination by developing water management systems.
- Provide a source of non-contaminated water for harvesting and other practices needed to maintain favorable conditions for ongoing cranberry cultivation.

1.4 REPORT CONTENT AND INTENDED AUDIENCE

This report includes summary information about the history of groundwater contamination at the Massachusetts Military Reservation (MMR) and the current and planned cleanup efforts associated with contaminant plume FS-28 and the primary constituent of concern, EDB. In addition, the document describes the alternatives developed to meet the objectives above and evaluate them by comparing their effectiveness, ease of implementation, and cost. Through a combination of various stakeholder meetings, the alternatives were narrowed. Based on stakeholder input and the need to balance competing interests, AFCEE is proposing a preferred alternative. This report documents the process used to develop, review, and select the preferred alternative.

Removal actions proposed in this report are the result of more than four years of investigation and data made available from the implementation of the FS-28 extraction system. Furthermore, the actions proposed were discussed at various stakeholder meetings that have occurred since January 1997, which brought together representatives from the Air Force Center for Environmental Excellence, Jacobs Engineering Group Inc. (the primary remediation contractor at MMR), Environmental Protection Agency, Department of Environmental Protection, Conservation Commissions of Falmouth and Mashpee, cranberry growers, bog owners and surrounding land owners. The intended audience for this report includes

environmental regulatory agencies, local communities and citizens of the area. Information provided in this report will be used by a variety of environmental agencies to make determinations regarding the applicability of their programs on the proposed removal actions and as background material for environmental permits. As such, this document is intended to provide engineering evaluations and cost analyses for all of the alternatives considered.

1.5 HISTORY OF MASSACHUSETTS MILITARY RESERVATION – SOURCE OF CONTAMINATION

The MMR was founded by the Commonwealth of Massachusetts in 1935 as a National Guard training camp and federalized in 1940 in order to prepare for World War II (The MMR includes Otis Air National Guard Base, US Coast Guard Air Station Cape Cod and Army National Guard Camp Edwards. It covers 34 square miles of upper Cape Cod (approximately 22,000 acres), and borders the towns of Bourne, Falmouth, Mashpee and Sandwich, Massachusetts (Figure 1-1).

Most of the industrialized operations associated with military use occurred in the southern portions of the reservation and included aircraft runways, aircraft and vehicle maintenance facilities, landfills, and firefighter training areas. From the 1940's through the 1970's, the time of MMR's heaviest military activity, large amounts of hazardous wastes were generated. The common practice for many years was to dispose of such wastes by placing them into the base landfills, dumping into storm drains, burning them in fire training areas or simply dumping the wastes on the ground. Unfortunately, during that time the military had limited knowledge regarding the environmental impacts from such actions.

The MMR reservation sits above an important and shallow groundwater aquifer that is the only source of drinking water for the towns in the vicinity. When contaminants such as fuels or solvents are spilled or improperly disposed of in permeable soils over a shallow aquifer they move downward until they reach and mix with the groundwater. Together, the contaminated mixture follows the natural subsurface

contours and flow down gradient, much the same as a surface stream, at a rate of approximately 1 to 2 feet per day.

1.6 HISTORY OF PLUME FUEL SPILL-28 (FS-28) AND EDB CONTAMINATION

This section presents the history of FS-28 plume investigations, the current understanding of the area extent of the plume and the results of a search for potential sources for the FS-28 plume.

1.6.1 History of FS-28 Investigations

The history of the FS-28 plume at MMR began in December 1992 when a groundwater sampling event was conducted to determine the downgradient extent of a known groundwater contaminant plume, CS-4. EDB was detected in a monitoring well at concentrations above the federal drinking water Maximum Contaminant Level (MCL) of 0.05 µg/L. In January 1993, additional sampling of monitoring wells confirmed the presence of EDB. Fieldwork began in April 1993 to investigate the presence of EDB in groundwater at the toe of the CS-4 plume.

Based on the findings of the 1993 investigation, several data gaps were identified for further study. In 1995, another field program was initiated with direction to find the downgradient extent of the EDB plume, determine the presence of EDB in the underlying silty clay unit, and further define the upgradient extent of the EDB plume.

During the field program, a monitoring well was installed in the vicinity of the Town of Falmouth's Coonamessett Water Supply Well. When EDB was detected in deep groundwater samples collected from this boring, the search for the toe of the FS-28 plume was expanded to a much larger geographic area. A total of 39 additional monitoring wells were installed to define the area extent of EDB contamination in the FS-28 plume.

1.6.2 Area Extent of FS-28 Plume

As currently mapped, the most northerly extent of the FS-28 plume, as currently mapped, is located in the Crane Wildlife Management Area, which is south of the MMR in Falmouth. The plume has a north-south orientation, is bounded on the east by Coonamessett Pond, on the west by Deep Pond, and extends to a point south of Hatchville Road in Falmouth. The leading edge of the plume is narrow, and is located north of Thomas Landers Road. The plume generally parallels the Coonamessett River, which flows south from the western arm of Coonamessett Pond to a tidal estuary, Great Pond, south of Route 28 in Falmouth[1] (see Figure 1-2, Coonamessett River Bogs & FS-28 Plume).

Groundwater containing EBD flows at a rate ranging from 0.02 to 0.2 feet per day (ft/day) in silty sands, and from 0.2 to 2 ft/day in outwash sands. Various numerical groundwater models that simulate the FS-28 plume transport have predicted that the discharge location for the EDB is the Coonamessett River. These models show that, in general, most of the EDB migrates to the surface waters of the Coonamessett River north of Sandwich Road, and the rest of the plume continues to migrate in the subsurface, very close to the river, eventually surfacing at points along the length of the river north of Great Pond.

Studies conducted by the AFCEE indicate that the EDB plume upwells in the upper part of the Lower Baptiste cranberry bogs and Broad River. This upwelling results in detectable concentrations of EDB in the Coonamessett River as it flows through the lower bogs. A portion of the plume also remains at depth in the aquifer north of Thomas B. Landers Road. Figures 1-3, 1-4 and 1-5 present surface water quality data from the upper, middle and lower cranberry bogs.

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[1] The physical characterization of the FS-28 plume site has been interpreted from data collected from more than 30 borings drilled in the study area.

As described in the FS-28 Technical Decision Memorandum (AFCEE 1997a), the EDB plume is also migrating to the surface south of Hatchville Road moving with the groundwater, which is flowing south and rising slightly to discharge in the Coonamessett River.

1.6.3 Investigation of FS-28 Plume Potential Sources

The FS-28 source investigation was primarily a search of the MMR Administrative Records for information about sites and activities that may have contributed in full or in part to the FS-28 EDB groundwater plume during the period from the 1930s to the 1970s. Because EDB was a common additive in the fuels used at the base, the investigation focused on those areas where motor fuel and aviation gases were stored, dispensed and possibly disposed. The investigation concluded that the FS-28 (EDB) plume was not produced by a single source but rather by a combination of sources over a period of 30 to 40 years.

The available data supported the early findings that the primary sources were fuel dispensing and maintenance facilities. Records were found that indicated that these sites had a history of motor fuels and aviation gasoline spillage. The sites were also found to be located adjacent to an aquifer that flows in a southwesterly direction; in alignment with the southwesterly trend of the FS-28 plume.

1.7 CRANBERRY OPERATIONS ON COONAMESSETT RIVER

Approximately 60 acres of cranberry bogs are operated on the Coonamessett River. A list of the bogs on the River system is shown in Table 1.1. The bogs vary in size from 0.8 acres to 13 acres.

Cranberry bogs are typically flooded in late November to early December to prevent freezing damage to the cranberry vines and again in the fall for harvesting. During flooding, the Coonamessett River is dammed up, raising the water level from 0.5 to 3 feet over the area of the cultivated bogs. Upward vertical gradients are reduced under flooded conditions, which keeps the groundwater from moving into the bogs.

Irrigation of cranberry bogs begins near the middle of April when the night temperatures are anticipated to be below freezing. For frost control during the spring, water is sprayed on the vines at the first sign of frost and this practice continues as needed until mid-June. From mid-June to October, the fields are irrigated as needed from 5 a.m. to 7 a.m. to provide at least 2 inches of water on the crop per week. Typically, spray irrigation is conducted three times during the week. During the fall, the bogs are harvested either dry or wet. The Baptiste Bogs, where EDB has been found upwelling, are dry-harvested since there is typically not sufficient water flow in the river to flood the bog. Furthermore, discussions with the cranberry growers in the Coonamessett River Valley revealed that the Thompson and Adams bogs are dry-harvested. The Chaston, Augusta, Reservoir, Middle and Lower bogs are wet-harvested. Water used for flooding of the Reservoir, Middle, and Lower bogs is derived from Pond 14.

1.8 ENVIRONMENTAL AGENCY AND CRANBERRY GROWER CONCERNS

EDB is the primary contaminant of concern in the FS-28 plume; it is also the most prevalent organic compound detected in samples collected in the FS-28 sampling program. The maximum concentration of EDB detected was at 16 micrograms per liter (μg/L) in samples of deep groundwater just south of Hatchville Road. The concentrations of EDB in the shallow groundwater and surface water are not as high as those in the deep groundwater. In addition, the concentrations in the shallow groundwater are higher than the concentrations in the surface water where EDB is discharging to the surface. The concentrations of EDB in the Coonamessett River decrease downstream. The highest concentration of EDB detected in the surface water and shallow groundwater are 0.36 μg/L and 3.9 μg/L respectively.

The EPA, DEP, and Massachusetts Department of Public Health (DPH) have determined that exposure to EDB-contaminated surface and ground waters for agricultural purposes presents an unacceptable risk to public health and the environment.

In addition, cranberry growers are very concerned about the perception that their crops are contaminated and therefore, unmarketable, even if their irrigation and harvesting waters are below the state drinking water standard for EBD of 0.02 μg/L.

1.9 OTHER ONGOING RESPONSE ACTIONS FOR THE FS-28 PLUME

A remedial investigation and feasibility study (RI/FS) is currently being conducted by AFCEE for a study area known as the Southwest Operable Unit. This operable unit includes groundwater, surface water and sediments associated with the Coonamessett River. The Draft Remedial Investigation report was released on October 29, 1998. This report includes a summary of the investigations that have been conducted within the study areas, delineates the nature and extent of contamination, discusses the fate and transport of the contaminants of concern and presents a human health and ecological baseline risk assessment. Preliminary Remedial Goals for the study area are also presented in the Report.

Once the Preliminary Remedial Goals are established, a feasibility study will be prepared to evaluate and compare removal alternatives. The removal actions that are proposed in this document will be consistent with any long-term remedial actions ultimately selected for the FS-28 plume. The Feasibility Study is scheduled for release on January 20, 1999.

In October 1997, AFCEE implemented a Time Critical Response Action for the FS-28 plume by installing an extraction well to intercept and treat the highest levels of contamination found in the plume. The groundwater is being extracted and treated at a rate of 600 gpm. Modeling studies were completed in March 1997 which evaluated the effectiveness of the extraction and treatment system (AFCEE 1998b). This report, the FS-28 Treatment System Extraction Well-1 (EW-1) Evaluation Report Time Critical Response Action, also evaluated five different extraction options. These scenarios included:

- Scenario A — No Action (no pumping of 69EW0001)
- Scenario B1 — 69EW0001 pumping at 600 gpm
- Scenario B2 — 69EW0001 pumping at 400 gpm
- Scenario C — 69EW0001 pumping at 400 gpm and new well 69EW0002 at 350 gpm
- Scenario D — 69EW0001 pumping at 650 gpm, and new wells 69EW0002 at 400 gpm and 69EW0003 at 250 gpm.

Locations of the extraction wells and their proposed screen intervals are shown in Figure 1-6. A fifth scenario(E) was added during the response to comments which evaluated shallow extraction wells placed in the Lower Baptiste bog area. Modeling results are summarized in Table 1-2.

1.10 ADDITIONAL FACTORS SUPPORTING A REMOVAL ACTION

The ongoing and proposed actions presented in this report are designed to mitigate the exposure and potential exposure to EDB. Because the fuel releases that created the FS-28/EDB plume happened so long ago (30-40 years), there are no response actions to stop or prevent the release. However, actions are available to treat the plume and mitigate the environmental degradation that currently exists.

In the event that clean water is not provided for agricultural purposes, there is a public perception that crops may be compromised and, therefore, unmarketable. In addition, without continued monitoring of EDB concentrations in groundwater, surface water, and treatment effluent, the EDB exposure to receptors residing near and working in the affected bogs cannot be measured, and the risk from exposure cannot be managed.

Because field investigations have determined that relatively high (16 µg/L) concentrations of EDB are present in deep groundwater upgradient of the area where the plume is discharging to the surface environment, concentrations of EDB in the surface water may increase significantly if no actions are taken.

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2.0 PREVIOUS AND ONGOING ACTIONS TAKEN

2.1 SUMMARY OF PREVIOUS ACTIONS

Several actions have already been taken to mitigate the risk of exposure to EDB in the FS-28 plume. They have included the following:

- Installed thirty monitoring wells in the vicinity of the river coupled within sampling and analysis to better define the distribution of EDB in these areas.
- Installed a wellhead treatment system to protect Falmouth's water supply well from FS-28 contamination with monthly monitoring of sentinel wells and the raw water supply.
- Conducted a private well sampling and analysis program for residents in the area of the EDB plume.
- Provided bottled water and information about the EDB contamination to 35 residents in the Hatchville area prior to installing connections to the public water supply.
- Installed approximately 16,700 linear feet of water mains to connect 85 private residences and one commercial business to the Falmouth public water supply.
- Collected air samples for EDB analysis in the area surrounding Broad River, where the highest surface water concentrations have been found since the testing program was initiated. Air sampling was also conducted during a spray event at the reservoir bog in July, 1997.
- Installed an eight-inch diameter extraction well (69EW0001) approximately 55 feet south of 69MW1284, within the area of highest EDB concentration. Over 280 million gallons of water have been treated and discharged into the Coonamessett River since the FS-28 treatment system was put into operation in October, 1997.
- Collected surface water samples at 61 locations, extending from the Coonamessett River headwaters at Coonamessett Pond to the outlet to Great Pond.
- Conducted two water level surveys in the FS-28 study area. Forty monitoring wells and piezometers were measured for water depth in a water level survey conducted October 1, 1996. On December 27, 1996, another water level survey was conducted. Water levels were measured in 171 monitoring wells and piezometers and the river stage was measured at 9 locations along the Coonamessett River.
- Completed shellfish residue study in August, 1997. The study was planned and coordinated by several Massachusetts state agencies. Shellfish were collected from Green Pond and an appropriate reference area and analyzed for EDB by the Massachusetts Department of Health laboratory. No EDB was detected.

2.2 SUMMARY OF ONGOING ACTIONS

The following actions are ongoing:

- AFCEE is currently providing operational and maintenance support for the water supply treatment system at the Coonamessett Water Supply Well (CWSW) wellhead. The activities include monthly sampling of the influent well water and upgradient monitoring wells to analyze for the presence of EDB. A preliminary design is being completed for the treatment system that will be turned over to the town of Falmouth for final design and construction. The wellhead treatment will continue as long as the well continues to be utilized by the town.
- AFCEE is currently preparing a Remedial Investigation and Feasibility Study for the Southwest Operable Unit (SWOU). FS-28 is included within this investigation and study.
- Surface water samples are being collected at 27 locations on a monthly basis along the Coonamessett River and at one site upgradient of Round Pond.
- A multi-agency task force developed the cranberry sampling and analysis protocol. An analytical laboratory (Southwest Research Institute) was selected by AFCEE, and berries were collected and tested in accordance with the established protocol. It is anticipated that this protocol will be used for the 1999 crop.
- Immediately following the conclusion of spray irrigation for frost protection, surface water samples are collected at five locations in the Coonamessett River and from two irrigation wells located in the Baptiste bogs. The analytical results of this sampling are used to evaluate the presence or absence of EDB. Any adjustments in the sampling locations and frequency are discussed at the weekly technical meetings before the changes are made.
- Existing GAC treatment system for EW-1 continues to operate and extract groundwater at a rate of 600 gpm.
- Stream discharge measurements and/or estimates of flow are being made at four cross-sections on the Coonamessett River on a monthly basis. The stream flow measurement locations coincide with the surface water sampling sites.
- Researchers from Kansas State University have been retained to conduct a study of the impact of EDB on cranberry plants and fruit. They will be investigating the level and rate of accumulation of EDB in the cranberry fruit.

3.0 STAKEHOLDER INVOLVEMENT

3.1 INTRODUCTION

EDB has migrated outside the MMR boundary and affected private and public water supplies, agricultural operations, and recreational activities. The search for solutions to the EDB contamination necessarily requires the involvement and consent of all affected parties and must extend beyond the MMR Installation Restoration Program Clean-Up Team. Therefore, identification, involvement, and coordination of off-base stakeholders have been a key factor in determining the direction, goals and route to success for the bog separation project.

3.2 STAKEHOLDER IDENTIFICATION

One of the unique aspects of the bog separation project is the quantity and diversity of stakeholder groups. The 90 identified individual stakeholders represent eight different agencies and 28 different offices. To date, the following stakeholders have been identified (refer to Figure 3.1 – MMR Cranberry Stakeholders):

- Town of Falmouth: Falmouth Selectmen, Falmouth Town Administration, Falmouth Conservation Commission, Falmouth Shellfish/Herring Constable, Falmouth Natural Resources, EDB Neighborhood Coalition;
- Congressional Delegation: Senator Kerry's Office, Senator Kennedy's Office, Representative Delahunt's Office;
- Cape Cod Commission;
- Cranberry Industry: Cape Cod Cranberry Growers Association, Cranberry Bog Owners and Operators, University of Massachusetts Cranberry Experimental Station, Ocean Spray;
- Commonwealth of Massachusetts: Executive Office of Environmental Affairs, Department of Environmental Protection, Department of Public Health, State Laboratory Institute, Division of Fisheries and Wildlife, Division of Marine Fisheries, Food and Agriculture Commission, and Buzzard Bay Project;
- Environmental Protection Agency: Superfund Section and Wetlands Section;
- United States Department of Agriculture Natural Resource Conservation Service;

- Massachusetts Military Reservation: Air Force Center for Environmental Excellence, Air Force Real Estate Agency, Joint Program Office; Army Reserve National Guard;
- The Army Corps of Engineers.

3.3 STAKEHOLDER MEETINGS

During the development of alternatives for the bog separation project, a number of meetings were held with the stakeholder community to discuss the purpose, goals, advantages and disadvantages of the various alternatives being considered. Copies of the minutes from those meetings are provided as appendices to this report (Appendix A).

3.4 STAKEHOLDER ISSUES

Many issues were raised by various stakeholder groups during the public meetings discussed above. The issues and concerns were documented to ensure that stakeholders concerns were seriously considered and, where appropriate, incorporated into the proposed range of alternatives. The following is a summary of the issues identified by each stakeholder group.

Falmouth

- Schedule must consider cranberry and fishery seasons;
- On-Going Maintenance of Bogs;
- Long-term Benefit of Separating Bogs;
- Ecological Impacts - flow, turbidity, erosion, turbulence, dissolved oxygen;
- Ponding, Water Retention Impacts;
- Vernal Pool and Natural Wetland Impacts;
- Flood Storage;
- Effects on Abutters;
- Air Quality;
- Pesticides;

- Clean Water Supply for Bogs;
- Future Use as Bogs/Wetlands.

Commonwealth

- On-Going Maintenance of Bogs;
- Vernal Pools and Natural Wetlands;
- Herring Runs and Brook Trout Habitat;
- Treated Water Discharge;
- Ponding Impacts;
- Construction Impacts;
- Active Treatment;
- Air Quality;
- Flood Storage;
- Impacts or Rare Species;
- Hydrological Balance;
- Mitigation;
- Long-term Outcome;
- Timing of Construction Season - Herring Run in Spring, Trout Spawn in Fall;
- Fish Health;
- Loss of Cranberry Acreage;
- Permit Requirements;
- Legal Authority.

EPA

- Analysis Alternatives;
- Plume Characterization;
- Impacts on Aquatic Habitat;
- Meet Water Quality Standards;
- Long-term Effects;
- Contingency Plan;

- Permits;
- Legal Authority.

Cranberry Growers

- Work with Towns and Growers;
- Win-Win for Everyone;
- On-Going Maintenance of Bogs;
- Communication – Updates;
- Clean Water Supply for Bogs.

MMR

- Implement action to return the bogs to production by 2000;
- Be protective of human health and the environment;
- Cost effective and timely response;
- Win-Win for Everyone.

3.5 BALANCING COMPETING INTERESTS

All of the issues raised by the stakeholders are important and have merit. These issues must be taken into consideration with respect to their impact on the overall bog separation project. However, the issues cannot all be incorporated in their entireties. The competing nature of some of the issues requires careful balancing by all affected groups. For example, the needs of seasonal fish migration can result in conflict with the water requirements for cranberry operations. The same is true of potential conflicts between the needs of natural wetland areas and agricultural production. Community interests, timing of activities, cost of solutions, and risk reduction must also be taken into consideration when balancing the needs of the project.

It is important to clearly state that no one stakeholder group takes priority over another stakeholder group. All of the stakeholder interests must be, and have been, taken into consideration. The preferred alternative identified in this report is

AFCEE's attempt to balance all of the competing interests. Each group benefits from some aspect of the proposed solution and no one group has been given preferential treatment.

3.6 ROLE OF FEDERAL, STATE, AND LOCAL AUTHORITIES

The EPA, the Commonwealth of Massachusetts, and the town of Falmouth are providing assistance to the Air Force in planning and conducting ongoing and proposed removal actions. As directed by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and the FFA (under CERCLA §120), the EPA is the lead agency for oversight of investigative and remedial actions performed at MMR (EPA et al. 1991, 1996). The Massachusetts DEP and DPH have advised AFCEE of the potential risks resulting from exposure to EDB-contaminated ground and surface waters, and the potential volatilization of EDB into the atmosphere from surface waters and spray irrigation. The Commonwealth and representatives from four surrounding towns serve in an advisory capacity to the EPA.

The town of Falmouth owns most of the land in the affected area south of Hatchville Road where the bogs are located. The land is leased on a long-term basis by the Falmouth Conservation Commission to a cranberry grower. The Conservation Commission has granted rights of access to the Air Force and its contractors to conduct studies and removal activities. Several other bogs along the Coonamessett River are privately owned and operated.

The town assisted AFCEE in extending water supply mains in Hatchville. The town managed the connection of 85 residences and one business to the mains, and provided oversight of construction and design assistance. The Air Force reimbursed the town for its expenses. The town has also provided technical assistance during the design and construction of the granular activated carbon (GAC) system at the CWSW, and continues to assist AFCEE in operation and maintenance of the GAC system.

3.7 REGULATORY FRAMEWORK

3.7.1 Defense Environmental Restoration Program

The Department of Defense's (DOD) statutory authority for the Air Force's Installation Restoration Program is the Defense Environmental Restoration Program (DERP) (10 U.S.C. §2701 et seq.). Among other goals, the DERP authorizes a defense program to accomplish the following:

- "(1) The identification, investigation, research and development, and clean-up of contamination from hazardous substances, pollutants, and contaminants."
- "(2) Correction of other environmental damage...which creates an imminent and substantial endangerment to the public health or welfare or to the environment." 10 U.S.C. § 2701(b)(1)-(2)

This statute provides DOD authority independent of Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) to carry out a cleanup program.

3.7.2 House of Representative Bill 3579

HR Bill 3579 (Sec. 10(g)(1), Emergency Supplemental Appropriations Act for FY98), authorizes a temporary (two-year) interest in local real estate to compensate the land owner and cranberry bog growers for not producing their crop during the growing years of 1998-1999. (Refer to Appendix A).

3.7.3 Comprehensive Environmental Response and Compensation Liability Act

Because EDB was an additive to aviation gasoline, the contamination from FS-28 is related to a fuel-spill site. The contamination is considered petroleum for purposes of CERCLA's definition of "hazardous substances" 42 U.S.C. § 9601(14). Therefore, CERCLA provides no authority for the bog separation project since CERCLA specifically excludes petroleum contamination. Because CERCLA does not apply, the permit exemption provision of CERCLA ("No Federal, State, or local permit shall be required for the portion of any removal or remedial action conducted entirely

onsite…" 42 U.S.C. .§ 9621(e)(1) does not apply. Thus, permits must be obtained for any regulated activity proposed for this action.

3.7.4 Applicable or Relevant and Appropriate Regulations

The Regulatory Criteria and Guidance (ARARs Analysis) for FS-28 Response Actions are listed in Table 3-1.

3.7.5 Summary of Required Environmental Permits

Table 3-2 lists the activities associated with the preferred alternative and provides an evaluation of environmental regulatory criteria that trigger the need for specific permits.

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4.0 ENVIRONMENTAL SETTING

4.1 PHYSICAL SETTING

The Coonamessett River originates at the western arm of the Coonamessett Pond above Hatchville Road. Coonamessett Pond is a 158-acre pond located on Mashpee Pitted Plain Deposits consisting of gravelly sand, pebble and cobble deposits, and occasional boulders (Oldale and Barlow 1986).

The Coonamessett River and Broad River provide a water source for 60 acres of commercial cranberry bogs. The Coonamessett River flows in a defined channel, but broadens out into several reservoir ponds below Sandwich Road. The reservoir ponds provide water storage for the cranberry operations. Below the Town bogs, the river flows through forested wetland toward Route 28, then into Great Pond, and eventually, Nantucket Sound.

4.2 RIVER FLOW CHARACTERISTICS

The upper reach of the Coonamessett River, from Coonamessett Pond to the Upper Baptiste Bog, has an average flow of 2 cubic feet per second (cfs) and averages 6 ft in width and 1 ft in depth. In the second reach of the river which extends from the Upper Baptiste Bogs to the Augusta Bogs the flow increases to 6.5 cfs, while the average width increases to 6.5 ft. and the depth 1.5 ft.

In these two reaches of the river, the bogs are either located at one side, located entirely in the river system (e.g., cranberry bogs are on both river banks), or are separated by dikes from the river. Table 4-1 summarizes the elevation of the bogs and the approximate elevation of the water when the bogs are flooded. For bogs that are not physically separated, the river system is temporarily dammed at the weir to block the flow of water. Normally, the bog operators place a few boards across the weir to temporarily slow the flow in the river. This is accomplished on the upper bogs by blocking the river on the downstream bogs first. Because the bogs are not isolated from the river, the river and the surrounding wetlands are flooded to protect

the cranberry vines. Figure 4-1 shows the surface area when the Baptiste E3, Adams, Lasalle and East Thompson bogs are flooded for winter protection. When flooded, the Baptiste E3, Baptiste E4, Adams, Lasalle and East Thompson bogs cover approximately 6.4, 7.1, 3.4, 2.3, and 3.1 acres, respectively. If these bogs are separated from the river, the surface area would be reduced to 1.9, 6.6, 0.8, 1.2, and 1.5 acres, respectively.

In the third reach, from Thomas B. Landers Road to south of Sandwich Road, the average flow increases to 8 cfs, while the average width increases to 8.5 ft and the depth to 1.3 ft. The East Thompson Bog and Chaston Bog are located in the third reach. The fourth reach extends from south of Sandwich road to Route 28. The average flow increases to 13 cfs, while the average width increases to 13 ft and the depth to 5 ft. Approximately 30-acres of active cranberry bogs owned by the Town of Falmouth below Sandwich Road are leased to the Handy Cranberry Trust. Additional information on flow characteristics may be found in Section 4 of MMR Draft Fuel Spill (FS-28) Plume Technical Decision Memorandum, Volume I (AFCEE 1997a).

Flax Pond outlets to a series of cranberry bogs just northeast of John Parker Road. The flow from Flax Pond eventually empties into the Middle Bog on the Coonamessett River. The Flax Pond bogs are flooded by using water from Flax pond when the Middle bog is also flooded. Recently, the Falmouth Shellfish Constable has been trying to establish a herring run into Flax Pond. Because the depth of flow is not adequate at the outlet of Flax Pond, using water that is conveyed from a bypass channel from Pond 14 to temporarily increase the pond elevation. As such, low levels of EDB contaminated surface water are transported to Flax Pond. Because of the very low levels of EDB and the large volume of Flax Pond, the outlet from Flax Pond is not anticipated to detect EDB, therefore, the Flax Pond bogs are not affected by the EDB contamination in the Coonamessett River. AFCEE began monthly sampling of the Flax Pond outlet and these bogs to verify this assumption.

4.3 REGIONAL HYDROGEOLOGY

A single groundwater lens extends from the Cape Cod Canal to Barnstable and Hyannis. This sole-source aquifer underlies the MMR and is referred to as the Sagamore Lens. It provides the only source of potable water to Upper Cape Cod. This unconfined aquifer system (i.e., in equilibrium with aquifer pressure) is recharged by infiltration from precipitation. The top of the groundwater mound is located in the northern section of the MMR. Precipitation contributes an average of 1.6 feet of groundwater recharge per year. Seasonal variations in rainfall produce annual water table fluctuations ranging from 1 to 3 ft. Since groundwater flow is radial from the recharge mound, the waters of the ocean form the lateral boundary of the aquifer on three sides (Nantucket Sound to the south, Buzzards Bay to the west, and Cape Cod Bay to the north). Bass River in Yarmouth forms the eastern boundary of the Sagamore lens.

4.4 ECOLOGICAL SETTING

Aquatic wetlands and terrestrial communities were surveyed to describe the plant and animal communities associated with the Coonamessett River and the commercial cranberry bogs. Wildlife use was documented and rare species surveys were performed. Field forms from the assessment are in Appendix B.

The Coonamessett River provides a source of floodwaters for the commercial cranberry bogs adjacent to the river. Several reservoir ponds located to the south of Sandwich Road are also part of the water management system for the cranberry operation.

4.4.1 Habitat Types & Land Uses

The principal wetland habitats include palustrine scrub-shrub wetlands, forested wetlands, and emergent marshes around the reservoir ponds and at Broad River. The scrub-shrub wetlands are associated with the abandoned cranberry bogs. Wetland habitats were classified according to the wetland classification scheme proposed by

the US Fish and Wildlife Service (Cowardin et al. 1979). The dominant upland community on undeveloped parcels of land is a pine-oak forest. Coonamessett Pond is not heavily developed, but single-family residences are present in proximity to the Town bogs and the privately operated bogs along the upper reach of the Coonamessett River. Recreational use is common along the perimeter roads and on the reservoir ponds where fishing is very common.

4.4.2 Vegetation

Red maple (*Acer rubrum*) and pitch pine (*Pinus rigida*) are dominant members of the wetland plant community along the Coonamessett River. Associate species include black gum tupelo (*Nyssa sylvatica*), gray birch (*Betula populifolia*), and white pine (*Pinus strobus*). Mature trees are approximately 50 ft. to 60 ft. in height and average 6 ins. to 10 ins. in diameter. Percent canopy cover in the forested wetland ranges from 45% to over 60%. Red maple and willow (*Salix* spp.) are common in the understory layer.

The shrub layer consists of common wetland indicator species including sweet pepperbush (*Clethra alnifolia*), black alder (*Ilex verticillata*), highbush blueberry (*Vaccinium corymbosum*), swamp azalea (*Rhododendron viscosum*), arrowwood (*Viburnum dentatum*) and speckled alder (*Alnus rugosa*). Associated shrubs are multifora rose (*Rosa multiflora*), fetterbush (*Leucothoe racemosa*), dangleberry (*Gaylussacia frondosa*), purple chokeberry (*Aronia prunifolia*), and with-rod (*Viburnum cassinoides*). The shrub layer averages 6 ft. to 12 ft. in height.

Wild grape (*Vitis labrusca*), catbrier (*Smilax rotundifolia*), poison ivy (*Toxicodendron radicans*), and Virginia creeper (*Parthenocissus quinquefolia*) vines are common in the wetland community. The herbaceous layer includes Canada mayflower (*Maianthemum canadense*), starflower (*Trientalis borealis*), and a variety of sedges (*Carex* sp.), grasses (Poaceae), and rushes (*Juncus* sp.). Sensitive fern (*Onoclea sensibilis*), cinnamon fern (*Osmunda cinnamomea*), royal fern (*Osmunda*

regalis), and marsh fern (*Thelypteris palustris*) are common in the ground cover with sphagnum moss (*Sphagnum* sp.).

The abandoned bog to the north of Hatchville Road is dominated by leatherleaf (*Chamaedaphne calyculata*), meadowsweet (*Spiraea latifolia*), water-willow (*Decodon verticillatus*), highbush blueberry, and common buttonbush (*Cephalanthus occidentalis*), with an herbaceous cover of soft rush (*Juncus effusus*), wool-grass (*Scirpus cyperinus*), shallow sedge (*Carex lurida*), Canada bluejoint (*Calamagrostis canadensis*), white beak-rush (*Rhynchospora alba*), cranberry vines (*Vaccinium macrocarpon*), ferns and sphagnum moss.

The Coonamessett River, from the Upper Baptiste Bogs to the outlet flume, is in commercial cranberry production, and the canopy layer is essentially absent. River substrates consists of sand and gravel. However, thick accumulations of organic muck are present in the Broad River and in the areas where the river ponds below Broad River and above the outlet flume. Aquatic macrophyte growth is abundant. Dominant aquatic species are ribbon-leaf pondweed (*Potamogeton epihydrus*), water-starwort (*Callitriche* sp.), burreed (*Sparganium americanum*), and a green algae. Below the outlet flume the river enters a scrub-shrub and forested wetland system with a sand and gravel substrate. The dense plant cover along the riverbank offers high quality cover habitat for fish and wildlife.

4.4.3 Bird Species

Bird species use the scrub-shrub and forested wetland systems associated with the Coonamessett River for breeding sites, cover habitat, and food. Mallards, Canada geese, wood ducks, belted kingfishers, and mute swans were observed on the Broad River. Red-winged blackbird, American goldfinch, gray catbird, song sparrow, common grackle, yellow warbler, and common yellowthroat are common in the scrub thickets of sweet gale (*Myrica gale*) on the margin of Broad River. Tree swallows and barn swallows were observed feeding on insects over the active cranberry bogs. Spotted sandpipers, great blue heron, and green-backed heron were observed feeding

from the exposed sandy banks of the Coonamessett River, while tree swallows, barn swallows, osprey and red-tailed hawk were recorded over the commercial cranberry bogs.

Bird species observed in the woodlands include blue jay, American robin, tufted titmouse, eastern wood pewee, northern cardinal, American crow, northern flicker, and hairy woodpecker. Potential species include great crested flycatcher, ovenbird, red-eyed vireo, rufous-sided towhee, eastern screech owl, and great horned owl (DeGraaf and Rudis 1986, Veit and Petersen 1993).

4.4.4 Fish Species

The Coonamessett River supports an anadromous fish run. The Town maintains the fish ladders in the river channel for the spring migration of alewives (*Alosa pseudoharangus*). Alewives swim from the salt water of Nantucket Sound to freshwater spawning areas in Coonamessett Pond. Fish survey data available from the MADFW (1993) reports that 12 fish species are present in Coonamessett Pond. Other fish species in Coonamessett Pond are smallmouth bass, largemouth bass, chain pickerel, brown bullhead, bluegill, killifish, yellow perch, white perch, golden shiner, white sucker, and pumpkinseed sunfish. Four-spine sticklebacks and darters were collected from the Coonamessett River below the reservoir ponds.

4.4.5 Insects

The aquatic invertebrate survey recorded representatives of the Odonata, Diptera, and Coleoptera Orders. Gastropods were represented by freshwater snails from the *Amnicola*, *Gyraulus*, and *Physa* Genera. *Pisidiidae* clams were present. Freshwater crustaceans were amiphipods (*Gammarus fasciatus* and *Hyaella azteca*) and isopods (*Caecidota* sp.). Aquatic invertebrates collected in 1990 from the Coonamessett River below the reservoir ponds are listed in Appendix B.

4.4.6 Mammals

Mammal species documented in the surveys include gray squirrel, red squirrel, white-tailed deer, and muskrat. Prior surveys recorded red fox, raccoon, eastern cottontail, and white-footed mouse at the site. Other potential species include meadow vole, striped skunk, eastern chipmunk, opossum, and coyote.

4.4.7 Amphibians & Reptiles

Amphibian species recorded include bullfrog, green frog, wood frog, Fowler's toad, pickerel frog, spotted salamander, and redback salamander in the woodlands. Potential amphibian include American toad and gray tree frog. The Massachusetts Natural Heritage and Endangered Species Program (NHESP) certified a vernal pool (CVP-390) habitat in the abandoned cranberry bog east of the commercial cranberry bogs near Broad River. Wood frog and spotted salamander egg masses and larvae were documented in the vernal pool. Adult bullfrogs and green frogs are also common. The vernal pool is separated from the commercial cranberry beds on the Coonamessett River by the access road that runs along the perimeter of the cranberry bogs to access the weir at Broad River.

Reptile species documented include eastern painted turtle, eastern garter snake, snapping turtle, and eastern ribbon snake. Potential reptiles include musk turtle, northern water snake, eastern box turtle, northern black racer, and northern ringneck snake (DeGraaf and Rudis 1983; Lazell 1976).

4.4.8 Rare & Endangered Species

The site is not located within an identified estimated habitat for any rare wetland wildlife species according to the 1997-1998 Massachusetts Natural Heritage Atlas prepared by the NHESP. In addition, the site is not identified as a high priority site for rare species or as an exemplary natural community. No state-listed rare plants or animals were recorded during the field surveys. The wildlife species recorded in the

field surveys are common and widespread throughout the area. Watch-list species recorded in the surveys include great blue heron, spotted sandpiper, and osprey.

5.0 DESCRIPTION OF ALTERNATIVES TO REMEDIATE EDB

5.1 INTRODUCTION & ASSUMPTIONS

Several alternatives were considered to remediate EDB of the Coonamessett River and associated cranberry bogs. This section describes the alternatives and evaluates the effectiveness, implementability, and cost of each alternative.

Following the EPA guidance document for non-time critical removal actions (EPA 1993), alternatives were evaluated for their effectiveness, implementability, and cost. This evaluation is presented and summarized in Table 5-1 for each of the alternatives. The table provides a side by side comparison of the alternatives while the descriptions are provided in the following paragraphs. Evaluating the protectiveness to the public and workers and the ability of the alternative to achieve the removal action objectives addresses the effectiveness of the alternatives being considered. Implementability of the alternatives is evaluated by assessing technical and administrative feasibility and availability of equipment and personnel. Table 5-1 also presents the capital, operation and maintenance costs, and the present worth of the alternative.

All of the alternatives assume the following:

- Alternatives must first be protective of human health and the environment and secondly return the bogs to active production. All active, developed bogs will be returned to production as soon as possible.
- Alternatives must be implemented without loss to eco-systems, natural habitat, or fish migration pathway.
- Waters in which the cranberry vines reside must have non-detectable levels of EDB throughout the year (for example winter flooding, fall harvesting and irrigation)
- Evaluation period is 10 years.
- Cost will be returned to a present worth for comparative purposes.
- All of the alternatives assume that the FS-28 Extraction Well One (EW-1) and the treatment system continue to operate continuously at either 400 or 600 gpm (unless upgraded with larger capacity) to intercept and capture the upgradient EDB contamination.

5.1.2 Summary of Coonamessett River Alternatives

Four alternatives are considered for the Coonamessett River, these include the following:

Alternative A:	Limited Action with Institutional Controls
Alternative B:	Channel Realignment and Passive Treatment of Groundwater
Alternative C1:	Channel Realignment and Active Treatment of Groundwater
Alternative C2	Active Treatment of Groundwater with No Channel Realignment
Alternative D:	Separate and Isolate All Downstream Bogs.
Alternative E:	Phased Approach: Active Treatment of Groundwater, Separate Effected Bogs from River, Provide Treated Water to Bogs

5.2 ALTERNATIVE A: LIMITED ACTION WITH INSTITUTIONAL CONTROLS

The limited alternative effectively removes most of the bogs from production for a period of 10 years or until sampling shows that the groundwater and surface water quality is acceptable. The groundwater modeling conducted for Fuel Spill 28 (FS-28) as described in the EW-1 Evaluation Report (Appendix B), indicated that the uncaptured portion of the plume would flush into the river system after 5-7 years. The cost estimate assumes that the bogs will be minimally maintained and that no crop will be harvested from the bogs. The estimate assumes that the lost revenue from not growing cranberry crops is $20,000 per acre per year. This cost reflects the loss of profits from not having a crop and maintaining a bog in a ready condition.

The alternative is effective at reducing risk to the cranberry worker since no crops will be harvested. However, the stream channel and ditches will likely need to be maintained to allow flows into and out of the bogs. Furthermore, some application of pesticides and herbicides may be required to keep the bogs in a ready condition. Assuming that the channels are maintained prior to fish migrations, there is no effect on the herring runs. Institutional controls would entail placing fencing around the upper bogs to limit unauthorized entry into the bog systems.

Assuming that 60 acres are not marketable for the entire ten year period, the present worth is estimated to be $8.8 million. Figure 5-1 presents the location of the bogs and identifies those that would have to be taken out of production for this alternative.

5.2.1 Alternative A: Features

- Remove all bogs except Flax Pond (D1 and D2) and the Upper Baptiste (E1 & E2) from production.
- Maintain bogs in useable condition.
- If necessary, install controls to limit access to bogs.
- Consider long-term compensation of bog owners for lost production.
- Continue to operate EW-1 Well and Treatment System.
- Continue sampling and monitoring.

5.2.2 Alternative A: Advantages & Disadvantages

ADVANTAGES	DISADVANTAGES
• No disruption to current use • Maintains bogs and channel • Limits food chain exposure	• Several years until bogs brought back to production • No improvement to bogs • Must seek additional federal legislative authority if bog owners are to be compensated for lost production.

5.3 ALTERNATIVE B: CHANNEL REALIGNMENT AND PASSIVE TREATMENT SYSTEM

This alternative realigns the river and creates two detention ponds for passive treatment in an area where EDB contaminated groundwater is upwelling into the river system. By removing the stream channel from the area of upwelling, periodic flooding of the bogs can occur without effecting fish migration. Figure 5-2 presents the major elements of Alternative B. It is anticipated that the surface water normally leaving the bogs may have detectable levels of EDB since the detention time in the constructed basins is relatively short (~ 12 hours).

In this alternative, the river is realigned into a new 2100-foot channel beginning at the entrance of the bog systems and continuing to the outlet of the Baptiste Bogs. The new channel impacts approximately 0.2 acres of an existing wetland (referred to as the 1285 Wetland). To mitigate for this loss, Area 1 and Area 3, approximately 0.4 acres in total, will be removed from cranberry production and converted to wetlands (see Figure 5-2). Area 3 will serve as a buffer area for stormwater runoff from Little John Road and may become a vernal pool.

Several stream channel alignment options were initially considered. These included keeping the channel in the current location, beginning the realignment just above Broad River, and constructing a berm across the river system. In the options that maintain the existing river channel, the channel would be lined to prevent contaminated groundwater from upwelling into the river. One option considered constructing a berm across the existing river channel to separate the Lower Baptiste Bog from the river. However, this option was rejected because a portion of the bog (or future vernal pool) would remain in the influence of the river system and management of the bog would have been difficult over the long-term.

Similarly, it was concluded that lining the existing river bed would have been very difficult with unknown impacts on fish and other natural resources.

After reviewing several other options, the option presented here as Alternative B was selected for detailed analysis since it removes the cranberry bogs <u>and</u> the groundwater upwelling area from the river system. The alternative provides two independent basins to control the upwelling and allows passive treatment to reduce the EDB concentrations in the river system. The new channel is created by two parallel, 4.5 foot high earthen berms. The interior channel berm (on the bog side) is 10 feet in wide at the top and provides the primary access to the bogs and containment area. The interior berm is sloped at 3:1 and lined with sand and gravel.

The exterior channel berm blends with the topography of the existing ground surface and has a top width of 15 feet. The surface is mulched, grassed with a 10 foot wide walking path and riparian edge adjacent the new stream channel.

Approximately 1600 feet of the new stream channel is constructed with a geomembrane or a low permeability geotextile to prevent/reduce upwelling into the new channel.

This alternative creates two detention basins in the area where EDB was found upwelling into the river system. Basin 1, connected hydraulically to Broad River, is located in the area of the highest contamination observed in the Coonamessett River system. In this alternative, the normal pool depth in Broad River is maintained at elevation 24.5 feet with a maximum pool depth at elevation 27.5. A berm is constructed across the Upper Babtiste bog to separate this bog from Broad River.

The 2.4 acre Basin 1 is excavated to an elevation of 21.0 feet, an elevation approximately 1.0 foot below current water levels in the area. The normal pool elevation will be maintained at elevation 23 and the basin will overflow via a flume, directly into the new river channel.

Basin 2 would be constructed similar to Basin 1. Basin 2 is approximately 2.4 acres and the existing bog and river channel would be excavated to elevation 21 feet msl. The exterior sides of the basin would be raised as needed to elevation 28 feet msl. Normal pool depth in Basin 2 would be maintained at elevation 22.5 ft and the maximum pool depth is 27.0 feet. The basin would outflow to the river with a weir control structure near the southern end. The intent of the basin is to serve as a polishing basin, such that the EDB concentrations would be reduced at the outflow.

This alternative also separates the Adams bog from the river with an 8 foot wide berm. The berm is approximately 500 feet in length and 3 to 4 feet in height. During winter flooding, alternative water sources are provided for cranberry operations in the Chaston, Adams, and western Thompson bogs. The sources of water are either treated

water from the FS-28 treatment plant or irrigation wells. In addition, by controlling flow into the basins, the water can be ponded over a short time period so that water flowing below the Baptiste bog does not contain levels of EDB exceeding the 0.02 μg/L standard.

In this alternative, 9 acres of cranberry bogs are removed from production. This acreage includes the area covered by Basin 1 and 2 and the eastern Thompson bog since these bogs cannot be isolated from the river. It is anticipated that the other bogs would be brought back into production for the 2000 harvest.

The obvious disadvantage of this alternative is the level of EDB in the upper river section between the Lower Baptiste bog and Pond 14 may remain at detectable levels. To provide non-detect water for cranberry operations, this alternative relies on coordinated water management practices by the growers to ensure that water is not taken from the river during the times of discharge from the passive treatment basins. The goal of this alternative is to achieve EDB levels less than 0.04 μg/L for water discharged when Basin 2 is at normal pool depth and non-detect for water discharged when the basin is at maximum pool depth. When separated at normal depth, the surface waters entering Pond 14 will be nondetect, thus achieving nondetect for the lower bogs.

The present worth of this alternative is estimated to be $2.3 million. This includes approximately $1,400,000 for construction of the river/bog separation and another $900,000 for the loss of 6 acres from production during the ten year period.

5.3.1 Alternative B: Features

- Continues to operate EW-1 groundwater extraction and treatment system at 600 gpm.
- Realigns approximately 2100 feet of the river channel to a side channel of the current bogs.
- Separates river from contaminated surface waters, including the Broad River.

- Installs barrier (lining) in the new river channel to prevent upwelling of groundwater.
- Creates two detention basins for passive treatment of EDB.
- Mitigates the loss of wetlands at a ratio of 2:1.
- Creates riparian zones and a buffer on the exterior side of the new river channel.
- Passive treatment basins can be returned to cranberry production following successful remediation.
- Monitors long term performance by analyzing surface and groundwater samples.

5.3.2 Alternative B: Advantages & Disadvantages

ADVANTAGES	DISADVANTAGES
• Separates flow to control contaminated groundwater upwelling in area • Improves fish passage over current conditions • Creates riparian zone	• Disrupts existing river channel • Doesn't eliminate EDB in upper river system, above Pond 14 • Relies on detailed understanding of groundwater movement for success • Creates the need for alternative water sources for flooding, particularly true for the upper bogs.

5.4 ALTERNATIVE C: SEPARATE UPPER BOGS AND TREAT UPWELLING GROUNDWATER

Alternative C has two options that differ regarding active treatment and re-alignment of the river channel in the lower Baptiste bog. Alternative C1 realigns the river channel as described in Alternative B and provides active treatment of the groundwater upwelling in the lower Baptiste Bog. Alternative C2 provides only limited active treatment with no channel re-alignment. A plan view of Alternative C is provided as Figure 5-3.

Alternative C1 separates the river to create Basins 1 and 2 and treats the upwelling groundwater using granular activated carbon. The groundwater is captured using shallow well points arranged near known groundwater upwelling locations in the two

Lower Baptiste Bogs. Well points are 2 inches in diameter, and installed vertically to a depth of 15 feet. The well points will be spaced 10 feet apart and are expected to yield of 10 to 15 gallons per minute (gpm) each.

The well points are connected to a common header pipe and groundwater is extracted using centrifugal pumps. Each basin has its own electric pump system, dewatering sumps, discharge pipe, and backup pumps. Groundwater is piped to an expanded FS-28 Treatment Plant.

Treated water is discharged back into the new river channel using bubblers at four locations. The bubblers are spaced at least 250 feet apart with a minimum 4 foot vertical drop to improve oxygen content of the discharge water. The bubblers will be installed prior to lining the stream channel.

Because of uncertainty regarding the required size of the future treatment plant, a pilot dewatering test is being conducted. The purpose of the pilot test is to determine the specific yield of the well points and whether the system can lower the water table to effect the downgradient EDB concentrations. Water extracted from the pilot test will be treated at the existing FS-28 Treatment Plant.

The present cost analysis assumes that the maximum design flowrate is 3,000 gpm. The normal operating design flowrate is 2,400 gpm (600 gpm from EW-1 and 1,800 gpm from the well points and sump). A carbon change out is assumed for every 170 million gallons treated.

The present cost of this alternative is estimated to be \$6.5—\$7.0 million dollars. This option returns all bogs but the area covered by Basin 1 and Basin 2 to active cranberry production within one year. It is anticipated that the bogs would be brought back into production for the Year 2000 harvest.

The present worth cost of Alternative C2 is estimated to be \$1.2 million. This option may return all bogs but the area impacted by the shallow wellpoints to active cranberry

production by the year 2000. This alternative is dependent upon the effectiveness of the shallow well pilot test. Alternative C2 utilizes the shallow well points and the remaining capacity of the FS-28 treatment plant after the EW-1 withdrawal is reduced to 400 gpm. The Coonamessett River channel is not realigned nor are the basins created and the FS-28 treatment plan is not expanded under this option. C@ relies on reducing the mass concentrations through active treatment so that EDB levels in the surface water entering Pond 14 are nondetect. To achieve this objective, the concentrations in surface water leaving the Baptiste bog must be reduced to 0.01 μg/L.

5.4.1 Alternative C1: Features

- Continues to operate EW-1 groundwater extraction and active treatment system to determine volume of water needed to meet objectives of full scale program.
- Realigns approximately 2100 feet of the river channel to a side channel of the current bogs.
- Separates river from other surface waters in Broad River Pond.
- Installs barrier (lining) in river channel to prevent upwelling of groundwater.
- Installs shallow wells and sumps to remove groundwater for granulated active carbon (GAC) treatment of EDB.
- Existing treatment plant used for EW-1 pilot program expanded to accommodate new GAC system.
- Discharges treated water back to river at four locations upstream of extraction point.
- Mitigates the loss of wetlands at a ratio of 2:1.
- Creates riparian zones and a buffer on the exterior side of the river channel.
- Basins can be utilized as cranberry bogs following remediation.
- Monitors long term performance by analyzing surface and groundwater samples.

5.4.2 Alternative C2: Features

- Continues to operate EW-1 groundwater extraction and active treatment system at 600—800 gpm.
- Installs shallow wells and sumps to remove groundwater for GAC treatment of EDB.
- Existing treatment plant used for EW-1 and well points.

- Discharges treated water back to river at four locations upstream of extraction point.

5.4.3 Alternatives C1 and C2: Advantages & Disadvantages

ADVANTAGES	DISADVANTAGES
• Gets entire river to non-detect faster than any other alternative	• Large treatment volume for C1 will be very expensive to operate and maintain
• Flexible program; allows pumping and treating groundwater at various rates	• Buildup of iron bacteria and organic growth will foul up treatment system
• Protects public by eliminating EDB from surface water sources	• Requires dispersion to river system as described under Alternative B.

5.4.4 Alternative C2: Advantages & Disadvantages

ADVANTAGES	DISADVANTAGES
• Uses existing treatment plant, no expansion required.	• Surface water concentration may range between MCL and ND
	• No backup system if lose power at treatment plant

5.5 ALTERNATIVE D: SEPARATE AND ISOLATE ALL DOWNSTREAM BOGS

Alternative D separates all of the effected bogs on the river system to prevent EDB from getting into the bogs. The upper bogs are realigned as described in Alternative B; the Coonamessett River is moved to the side channel on the western side of the East Thompson bog and separated from the bog by new berms. The Reservoir, Middle and Lower bogs are separated from the river by constructing earth berms on either side of current river channel. The top of the berms are 8 feet wide and at least 1.5 feet above the highest point of each bog. The plan for Alternative D is provided as Figure 5-4. This alternative removes the bogs from the river system and controls flooding for harvesting and winter protection. The flooding will also reduce the concentrations of EDB in the upper reaches of the river system. Harvest and winter flooding would be

provided using non-detect water from the river via the basin passive treatment system described in Alternative B.

The present worth of this alternative is estimated to be $1.1 million.

5.5.1 Alternative D: Features

- Continues to operate EW-1 groundwater extraction and treatment system.
- Realigns approximately 2100 feet of the river channel to a side channel of the current upper bogs.
- Constructs berms on either side of the river on lower bogs to prevent EBD contamination of bogs.
- Separates river from other surface waters in Broad River Pond.
- Installs barrier (lining) in river channel to prevent upwelling of groundwater.
- Creates two detention basins for passive treatment of EDB.
- Provides clean source of water from passive treatment system for cranberry production, but require water management practices, by the growers, during flooding.
- Mitigates the loss of wetlands at a ratio of 2:1.
- Creates riparian zones and a buffer on the exterior side of the river channel.
- Basins can be utilized as cranberry bogs following remediation.
- Monitors long term performance by analyzing surface and groundwater samples.

5.5.2 Alternative D: Advantages & Disadvantages

ADVANTAGES	DISADVANTAGES
• separates flow to control contaminated groundwater upwelling in upper bogs	• disrupts existing river channel
• separates river with contaminated water from productive bogs	• does not eliminate EDB in upper river system, above Pond 14

ADVANTAGES	DISADVANTAGES
• passive treatment basins provides clean source of water for cranberry production, but relies on water management practices as describe in Alternative B to control and reduce the upwelling of contaminated water	• creates need for alternative sources of water during fall harvest
• improves fish passage over current conditions • creates riparian zone	• channeling river decreases available area (bogs) to serve as buffer for +100 year flood events • bogs may leak through the subsurface since there is not an impermeable boundary beneath the bog. This may require a constant source of water will be required to supply the bogs. Flood water may need to be pumped from the FS-28 treatment plant. • cranberries probably not marketable due to EDB in the surface water in river near the crops

5.6 ALTERNATIVE E: PHASED APPROACH - PREFERRED ALTERNATIVE

This alternative involves providing alternative water for flooding the upper bogs separating the river from the Baptiste, E3, Adams, Lasalle and East Thompson bogs, and active treatment of groundwater. A plan view of this alternative is provided as Figure 5-5. The active treatment system will reduce the concentrations in the surface water so that the EDB concentrations entering Pond 14 are non-detect. If non-detect is attained, no additional action is required for the bogs below Pond 14. However, improvements to the outlets at Pond 14 and Flax Pond are included in this alternative to improve the fish migration.

Other optional sources of water considered but rejected for this alternative included intercepting the Coonamessett river upstream of the point where upwelling of contaminated groundwater enters the river, installing new irrigation wells at each bog,

withdrawing from the Town of Falmouth water supply, or pumping surface water from Round Pond.

Surface water sampling over the period from December 1996 to September 1998 has shown that the Baptiste E1 and E2 bogs do not have detectable levels of EBD, and therefore no action is required for these bogs. Furthermore, sampling over the past year has also shown that if bogs are separated and alternative water is provided, surface water within the bogs will not have detectable levels of contamination.

5.6.1 Alternative Source of Water

To avoid using potentially contaminated river water for cranberry operations in the upper bogs, treated water from the existing FS-28 treatment plant will be used. Groundwater is extracted from a well at Hatchville Road, treated with a GAC system and then discharged to the bogs.

A pipeline from the treatment facility to the bogs is constructed on existing bog roads and includes a series of valves to control each of the 10 discharge points. The pipeline is approximately 3800 feet in length and includes 10 different locations to discharge the treated water into the bogs. The pipe is constructed of high density polyethylene and installed at least 2 feet below the ground surface. One road crossing at Thomas B. Landers is required. Vertical bubblers, similar to the system presently in use on the Coonamessett River, is used to discharge treated water into the bogs. The bubblers serve two important functions. They add oxygen to the water and reduce potential erosion at the discharge point.

Due to the large volume of water required and the need to have water in reserve, particularly for the Augusta and West Thompson bogs, a holding pond will be constructed on the Augusta property. The one acre holding pond requires clearing a 1.7 acre upland area and is approximately 6 to 8 feet deep.

5.6.1.1 Features of Alternative Source of Water

- Provide a source of clean water for flooding the bogs using effluent from the existing treatment system.
- Remove two weirs to separate Augusta bog from river.
- Design discharge pipeline to accommodate 800 to 1800 gpm. The line could also be plumbed to the existing irrigation wells to supplement flow if necessary. Bury discharge pipeline in the existing bog access roads.
- Construct a holding pond on the Augusta Bog to store treated water. Excavated material is then used for the proposed berms. Holding pond would likely not be required if the existing treatment plant is expanded.

5.6.1.2 Advantages & Disadvantages of Alternative Water

ADVANTAGES	DISADVANTAGES
• Provides clean water to bogs that are already separated from the river • Cranberries marketable for Fall 99 in Augusta, Chaston, and West Thompson bogs	• Without new reservoir, may not be able to flood bogs fast enough in emergency weather situation • Requires cooperation among the bog growers to utilize the treated water

5.6.2 Separate Active Bogs from River using Berms or Vinyl Sheet Piles

In this element of Alternative E, three of the upper bogs (Adams, Lasalle and East Thompson) are separated from the river using berms or sheet piles to prevent contaminated surface water from flowing into the bogs. If the bogs are separated using a earthen berm, it will be constructed entirely on the active bog area. Because the river runs through East Thompson bog, the berm will be constructed on the east side of the river. The west side of this bog, approximately 1.2 acres will become inactive except for periodic maintenance. The eastern side of the bog would be kept as an active cranberry bog. Placing a berm on the east side of the river could reduce the flooding to a nearby abutter.

The berms will have a width of 8 feet and maximum sideslopes of 2(horizontal) to 1 (vertical). They will be approximately 3 to 4 feet in height with flumes installed bog

for drainage. The sides of the berm will be vegetated and topped with gravel for access. Details of the berms are provided in Section 6.0, "Construction Plan – Preferred Alternative".

Vinyl sheet piles are also being considered as a way to separate the bogs from the river system. The vinyl sheet piles reduce the surface area of the bog that would be lost by constructing a berm, but do not allow for vehicle access around the perimeter of the bog. The sheet piles are designed for aquatic environments and are manufactured from inert, recycled plastic. The sheet piles are installed by a rubber tired backhoe. The piles extend approximately 8 to 10 feet into the ground and protrude 2 to 3 feet above the ground surface. Details of the sheet piles are provided in Section 6.0, "Construction Plan – Preferred Alternative".

5.6.2.1 Features of Separation of the Active Bogs

- Continues to operate EW-1 groundwater extraction and treatment system.
- Continues surface water sampling program.
- Provides either earthen berms or sheet piles to separate the active bog from the river system.
- A cutoff wall may be required where the bog channels and the river are in close proximity.

5.6.2.2 Advantages & Disadvantages of Bog Separation

ADVANTAGES	DISADVANTAGES
• Separates the river from the bog thus allowing water to be held by the bog grower during fertilizer or pesticide applications • Conserves water and utilizes best management practices for flooding	• Requires active area to be taken out of production for the berms • Water may leak when the bog is flooded for cranberry operations thus requiring a constant source of water to maintain the flood depth

5.6.3 Active Treatment to Reduce EDB Levels in the River

Active treatment is being considered in this alternative to reduce the levels of EDB in the surface water leaving the Baptiste Bog. Active treatment includes extracting groundwater from shallow well points within areas of upwelling. The contaminated water would then be treated at the FS-28 treatment system using granular–activated carbon and then discharged back to the river. The goal of active treatment is to lower the EDB concentrations to less than 0.04 μg/L in the Baptiste Bog, and to achieve non-detectable levels entering Pond 14. Based on the results of the pilot test, achieving nondetect at the outlet of the Baptiste Bog does not seem possible.

5.6.3.1 Features of Active Treatment

- Continues to operate EW-1 groundwater extraction and treatment system but reduces flow from 800 gpm to 400 gpm.
- Installs shallow well points in Lower Baptiste Bog to capture upwelling of contaminated groundwater.
- Uses shallow well points to extract 350 gpm to achieve a 10-fold decrease in EDB concentration.
- If well points do not achieve 10-fold decrease in EDB using 350 gpm, expand into a full scale wellpoint extraction and treatment system for 1,000 to 1,800 gpm including expansion of the EW-1 Treatment Plant.
- Continues surface water sampling program

Details of the groundwater extraction and treatment system are provided in Section 6.0, "Construction Plan – Preferred Alternative".

5.6.3.2 Advantages & Disadvantages of Active Treatment

ADVANTAGES	DISADVANTAGES
• May accelerate removal of EDB • Removal of ponded water in Lower Baptiste bog will improve natural groundwater upwelling and thus collection for treatment	• Need pilot test to design adequately design the full scale system and gauge the effectiveness and costs. • May not achieve 10-fold decrease with only 400 gpm

	• Need power source and additional piping to treatment plant • Temporarily lose 9.0 acres of cranberry bogs

Alternative E removes the Lower Baptiste bog (6.6 acres) and a portion of the East Thompson bog (2.4 acres) from active cranberry production. These bogs could be returned to production once the contamination is reduced to acceptable levels.

The estimated cost of Alternative E ranges between $1.7 to $4.9 million depending on whether the existing treatment plant requires expansion.

5.7 COMPARISON OF THE ALTERNATIVES

During the many stakeholder meetings that have been held to address the EDB contamination in the Coonamessett River it was obvious that alternatives A through D could not satisfy all of objectives or be accepted by the stakeholders. However, there were elements within each that were acceptable which is why Alternative E was derived and advanced forward as the preferred alternative by AFCEE. Those favorable elements from the various plans included providing an alternative water source to the upper bogs, separating some of the bogs from the river and providing active treatment to reduce the level of contamination in the river.

Alternative A was not acceptable to the regulatory agencies, growers, or AFCEE since there is no reduction in the EDB contamination in the river system. Alternative A basically takes the bogs out of production until acceptable levels are found in the river system. Because of the compensation, Alternative A was one of the more expensive alternatives. Furthermore, additional legislation would need to be obtained for compensation beyond the authorized two year period.

Alternative B relies on passive treatment to reduce the levels in the river after creating storage basins when the upper part of the Coonamessett River was moved to one of the

perimeter bog ditches. Alternative B also lined a portion of the new river channel to eliminate contamination in the new channel and it includes construction of a berm on the Adams bog to separate the bog from the river. While the alternative was technically feasible, it is not administratively feasible since moving the river and changing the ecological system would require federal permits be obtained which could take well over one or two years to secure. Furthermore, there is an element of risk that the alternative may not passively reduce the concentrations because the detention time in the basins may not be long enough. However, separation of the Adams bog is administratively feasible since the berm would be constructed on the active bog thereby exempting the construction activity from federal and state permitting as discussed in Section 3.0. Separation removes the contaminated river water from the active portion of the bog. This separation has been actively demonstrated on the Augusta and Chaston bogs with monthly surface water sampling events. Thus, separation of the upper bogs as described in Alternative E was advanced since it is effective and implementable.

Separation alone, as described in Alternative D, is not technically feasible. Alternative D relies on water management practices between the bog growers to provide a source of clean water. During the winter the growers take water on and off the bogs depending on air temperatures, snow, and ice. In addition, there will be loss of water from the bogs that will need to be replenished on a daily or weekly basis. For these reasons, alternative D by itself is not technically feasible. AFCEE has demonstrated that when lower Baptiste bog is flooded that the EDB concentrations in the river can achieve non-detect entering Pond 14. Therefore, if alternative water is provided to the upper bogs (Chaston, Augusta, Thompson, Adams, and Lasalle) and active treatment is added to reduce EDB concentrations in the river system, then the all of the bogs can be protected.

Alternative C1 included active treatment and expansion of the treatment plant, but the quantity of water that would be removed by this alternative may result in unacceptable ecological impacts and it also relied upon moving the river channel. However,

Alternative C2 does not require that the channel be moved, but unlike alternative C1 there will still be detectable levels in the river system. C2 relies on removing enough EDB mass prior to reaching surface water such that the level in the river leaving the Baptist bog is less than 0.04 μg/L. Thus, alternative C2 with portions of Alternative B and D are effective and implementable and were retained as part of Alternative E.

Alternative E includes active treatment using the shallow well points to reduce the concentrations and the treated water is used as an alternative water source for the upper bogs. The treated water would be used to fill the bogs for winter protection and to replenish the volume lost to leakage. Alternative E also includes storage of treated water near the Augusta bog to provide another source of water for flooding. Alternative E incorporates the most effective and publicly acceptable elements of the other alternatives and is being advanced as the preferred alternative as described in Section 6.0. It is both technically and administratively feasible. Depending upon the level of active treatment that is required, the alternative is cost effective.

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6.0 CONSTRUCTION PLAN – PREFERRED ALTERNATIVE

This section presents a more detailed description of the preferred alternative. It describes the design basis that will be used for each of the major components as well as identifies the primary materials and methods that will be used for construction. The preferred alternative is described in detail to begin the permit process. The components of the alternative may change during the permit process. These changes will be documented as Orders of Conditions on the permit application. Furthermore, it is anticipated that changes may also occur during the public information period. Changes will be described in the Action Memorandum when the final removal action is documented for the regulatory agencies. A preliminary construction schedule for the preferred alternative is also presented. Detailed site plans are provided in Appendix C.

6.1 DESIGN BASIS

This section presents the design basis for each of the major components of the preferred alternative. The design basis includes a description of the component and identification of the major design parameters that will govern sizing of equipment and quantities of materials for the full-scale design.

6.1.1 Alternative Source of Water

A pipeline will be installed as part of the preferred alternative that will deliver treated water from the EW-1 treatment plant to each of the upper bogs along the Coonamessett River. This pipeline will be used to flood the bogs during harvesting and for winter protection instead of using water directly from the river which may continue to have low concentrations of EDB. A water storage reservoir will be constructed to the north of the Augusta Bog, also for use during bog flooding. The general design basis parameters are as follows:

Pipeline:

Flow Rate:	800 gpm
Pipe route:	As shown in Figures 5-5 and 6-1
Type of Pipe	HDPE
Valves:	Butterfly/Gate Valves
Discharge Pressure Available:	30 psi
Pressure Rating of Pipe:	80 psi

Reservoir:

Volume:	Approximately 500,000 gallons
Dimensions:	1 acre 6 to 8 feet deep

6.1.2 Bog-River Separation

A physical barrier to isolate cranberry plants from EDB contaminated water is required to allow for the commercial sale of cranberry fruit. The barrier will need to prevent EDB contaminated surface water from contacting the plants, while not impeding flow in the river. Two options exist: earthen berms or a sheet pile wall.

Option #1 Earthen Berms. An earthen berm will be constructed after removing bog vegetation to protect the cranberry plants from exposure to EDB. The berm will be constructed to allow for light to moderate load vehicles to travel and work from the top of the berm. The berm design presented here is based on an industry standard for bog perimeter berms.

Construction Detail:	As shown on Figure 6-3
Side Slopes:	2 vertical to 1 horizontal
Width at Top:	10 feet
Top Elevation:	Minimum 2.5 feet above bog planting sand, as required by bog owner
Resistance to flow:	The use of low permeability soil for berm construction

Option #2 Sheet Pile Wall. Vinyl sheet piling will be used to for a barrier to separate water flow on the bog from the adjacent Coonamessett River (Figure 6-4). The joints between individual vinyl sheets will be sealed with either a hydrophilic paste or a suitable grout mixture. The sealing agent will be tested for both chemical compatibility with site contaminants as well as its leachability characteristics. Sheets will be advanced to the depths required to provide adequate structural support for the wall to resist site loading conditions. Water-tight weirs will be constructed as required to allow for operation of the bog. The general design basis parameters are as follows:

Type of material:	virgin and recycled PVC
Depth of Penetration:	8 – 10 feet
Exposed Wall Height:	2 – 3 feet (based on bog owner requirements for harvest equipment)
Seam Sealant:	water-tight, EDB resistant and non-leachable

A comparison of the two separation options is presented in Table 6-1.

6.1.3 Active Extraction System

Previous investigations have shown that the northern part of the Lower Baptiste Bog is the primary location of the upwelling EDB-contaminated groundwater (AFCEE 1997a). By installing an active extraction system, a large part of the mass of EDB that is currently discharged to the bogs and river will be captured and treated. Erosion and silt control measures will be implemented when working near the river to install additional extraction wells.

Well Point Extraction System. The preferred active extraction system will consists of a shallow well point extraction system installed in the Lower Baptiste Bog. A series of shallow well points will be installed in the bog and groundwater will be extracted to capture the EDB-contaminated groundwater. The actual configuration and extraction flow rate of the shallow well points will be determined based on the results

of a pilot-test of the shallow well point extraction system. The pilot test will consist of 36 well points on a 60 ft by 60 ft grid with 10-foot center to center spacing as shown in Figure 6-1. A step testing procedure that increases the extracted groundwater flow rate from 200 to 400 to 800 gpm will be completed over a 48 hour period. The results will be used to determine the appropriate full-scale extraction system. It is anticipated that the full-scale extraction system will have one of the following design configurations.

Configuration A:	Number of Wells:	35
Well Spacing:	10 feet	
Total Flow Rate:	400 gpm	

Configuration B:	Number of Wells:	168
Well Spacing:	10 feet	
Total Flow Rate:	1000 gpm	

6.1.4 Treatment System

Depending on the option selected for the active extraction system, various modifications to the existing EW-1 treatment plant may be required. The primary factors that affect the selection of plant modifications are flow rate and influent.

Flow Rate:	Active Extraction Option 1A:
EW-1:	400 gpm
Well Points:	350 gpm
Active Extraction Option 1B:	
EW-1:	600 gpm
Well Points:	1000 gpm
Influent Concentration:	Up to 2 µg/L EDB
Effluent Concentration:	EDB < 0.02 µg/L or below detection limits if technically and economically feasible.

Based on groundwater concentrations, it is not anticipated that organic or inorganic chemicals other than EDB will be present in the extracted groundwater that require treatment. During the pilot test, however, samples will be analyzed for other compounds that may affect selection of the treatment process. The existing EW-1 treatment system consists of two 20,000-pound GAC units in series as shown in Figure 6-2. This existing system would be used for flow rates up to 800 gpm. For treatment flows larger than 800 gpm, the existing plant will be expanded with similar equipment.

6.2 CONSTRUCTION MATERIALS

This section lists the primary construction materials proposed for each component of the preferred alternative.

6.2.1 Alternative Source of Water

Materials for construction of the alternative source of water will consist of the following:

Pipeline

Pipe material	HDPE
Valves	Steel or Cast Iron
Pipe bedding	Gravel or screened gravel

Water Storage Reservoir:

Reservoir Grade:	Native soils

6.2.2 Bog-River Separation

Option #1, Low-permeability material. Low-permeability soil material shall consist of clayey gravels or poorly graded gravel-sand-clay mixtures (Unified Soil

Classification group symbol - GC); or clayey sand or poorly grade sand-clay mixtures (Unified Soil Classification group symbol - SC)

Gravel material:	A well graded granular borrow material with a maximum stone size of 3 inches and a maximum of 12 percent by weight passing the 200 sieve.
Vegetative soil material:	Loam suitable for planting – lime to a pH of 6.5 according to soil test or apply at the rate of 100 pounds per 1,000 square feet. Apply 10-10-10 fertilizer at the rate of 100 pounds per 1,000 square feet. Incorporate lime and fertilizer into soil by harrow or raking.
Seed:	Apply 100 pounds per acre of D.E.P. Erosion Control Seed Mix No. 1 or Hales Seed Company Conservation Mix. Protect 2:1 slopes with jute netting.
Flume:	To allow bog drainage provide flumes constructed of 15-inch corrugated metal pipes and a manually operated canal gate. Anti-seep collars shall be required on pipe sections which penetrate the berm.

6.2.3 Active Extraction System

Materials for construction of the active extraction system will consist of the following:

Well Point Extraction System:

Well points:	Carbon steel
Extraction Pipeline headers:	PVC (white)
Well Point Pump House:	Wooden shed on concrete pad
Well Point Pump:	Cast iron vacuum pump
Extraction Pipeline to Treatment:	HDPE

6.2.4 Treatment System

Materials for construction of the treatment plant expansion, if necessary, may consist of the following:

Building:	Wood or metal structure on concrete foundation
Pipes	Carbon steel
Carbon Units:	Epoxy-coated carbon steel
Pumps:	Carbon steel or cast iron

6.3 CONSTRUCTION METHODS

All construction methods within the work area will follow safe work practices to protect the river, bogs, and wetlands. Protective measures include sedimentation and erosion control, secondary containment of fuels and equipment, and noise abatement.

6.3.1 Alternative Source of Water

Installation of the proposed alternative water supply pipe will employ conventional pipe trench construction methods. The actual trench method will be determined during the final design. The water supply reservoir will be constructed by excavation of an existing upland area to regrade the area as a reservoir. Excavated material will be used elsewhere at the bogs for berm construction. During construction, soil erosion and sedimentation control measures will be implemented to minimize the effect of construction on the Coonamessett River, the bogs, or other adjacent wetlands.

6.3.2 Bog-River Separation

Option #1 – Berms. Prior to construction activities, soil erosion and sedimentation control measures will be implemented to minimize the effect of construction on the Coonamessett River, the bogs, or other adjacent wetlands. Erosion control measures (silt fences) will be placed at least two feet beyond the proposed toe of the berm. During berm construction, procedures shall be used to limit construction equipment and supplies outside the limits of the berm. If access outside the limits of the berm are required, geotextile fabric shall be placed on top of bog plants and low contact

pressure rubber-tired equipment shall be used. Generally, the construction of the berm shall consist of:

- Installation of temporary erosion and sediment control measures.
- Grubbing the limits of the berm to remove organic matter.
- Installing drainage flumes.
- Placing and compacting the low permeability soil material.
- Completing the berm by placing and compacting the gravel material.
- Loam, seed, and mulch berm side slopes and other disturbed areas.

Erosion and sediment control measures shall remain in place until disturbed areas are stabilized with vegetation.

Soil material placed in the berm shall be placed in 12-inch maximum lifts. Each lift shall be compacted to a minimum of 90-95 percent of the maximum dry density (ASTM D 698). In-place density testing (ASTM D 2922 or ASTM D 1556) shall be conducted at the rate of one test per lift per 500 linear feet of berm length. Excess soil materials or grubbed materials shall be removed from the site and shall not be disposed of in bogs or wetlands.

Option #2 – Vinyl Sheet Pile. Vinyl sheet pile will be advanced using a low ground-pressure backhoe with a vibratory hammer. Vinyl sheets could be carried either in the backhoe bucket, or by hand. A temporary, movable bracing system will be used to aid in advancing the sheets plumb and straight. Siltation fencing will not be required, since no soils will be brought to the ground surface. The sheets will be installed to minimize encroachment onto the bog, and will not be installed within the river. The construction will ideally occur in the winter, when a thin sheet of ice is present over the plants. Construction when no ice is present will utilize a reinforced geotextile composite along with the low ground-pressure equipment to minimize damage to plants. A temporary removable bridge will be constructed over the river, with plants lain back at the bearing surface of the bridge.

6.3.3 Active Extraction System

Well Point Extraction System. Access to the bogs for installation of the well points will be limited to specific locations and accomplished by a temporary bridge. Well points will be installed by hydraulic jetting using river water. Pipe headers will be installed aboveground and will be supported by the well casings to minimize the impact on the bogs.

6.3.4 Treatment System

If the treatment system requires modifications or expansion, construction will follow established procedures for building construction. During construction, soil erosion and sedimentation control measures will be implemented to minimize the effect of construction on the Coonamessett River, the bogs, or other adjacent wetlands.

6.4 SCHEDULE

A schedule for the preferred alternative has been prepared and is presented in Figure 6-5. The schedule shows completion of the preferred alternative by late-May, 1999.

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7.0 ENVIRONMENTAL MONITORING

The purpose of this section is to outline the environmental sampling for the area surrounding the Coonamessett River, and the leading edge of the EDB plume associated with FS-28. The emphasis of this plan is centered on risk management and performance and impact monitoring for the ongoing and proposed response actions for FS-28. The monitoring plan is fully described in the Draft Final Fuel Spill-28 (FS-28) Monitoring Plan (AFCEE 1998d).

The specific aspects for the environmental monitoring program are (1) environmental monitoring to manage risk to human health from EDB exposure, (2) removal action performance monitoring, and (3) ecological impact monitoring. In some cases, environmental monitoring data will meet the objectives of more than one task. For example, Coonamessett River surface water sampling data for EDB and field parameters will be used to assess human health risk, the performance of the treatment system, and the ecological impact of treated water discharge. When possible, environmental monitoring data will be collected to maximize usability and minimize redundancy. Data will be collected in accordance with the MMR *Quality Program Plan* (ACEE 1998a).

7.1 SURFACE WATER SAMPLING

Surface water sampling will be conducted to manage human health risk and assess the marketability of the bogs on the Coonamessett River. As discussed in the FS-28 Action Memorandum (AFCEE 1997b), a surface water decision tree (Figure 7-0) is used to compare EDB concentrations in surface water to risk equivalent concentrations (RECs) which are linked to appropriate response actions that will be followed to manage risk to human health via exposure to EDB in surface water.

Surface water from the Coonamessett River will be sampled to monitor EDB concentrations for the purpose of managing risk to human health. On a monthly

basis, surface water samples will be collected from 69SW0014 69SW0046, and 69SW0049 for EDB analysis (Figures 1-3, 1-4 and 1-5).

Samples will also be collected monthly from the developed bogs (Tables 7-1 and 7-2). To market the cranberries, the water that comes in contact with the vines are grown must have non-detectable levels of EDB for at least one year. Sampling will be conducted monthly to monitor the levels of EDB from the inflow and outflows from the bogs.

7.2 AIR SAMPLING

Air will be sampled if EDB in surface water concentrations exceeds 0.5 µg/L. If the surface water is found greater than 0.5 µg/L, AFCEE will immediately resample the surface water to confirm the results. If the second set of samples exceed 0.5µg/L, one air canister will be collected just above the surface water and then one sample will taken at a down wind and upwind location. Air samples will be collected over a eight hour period and tested in accordance with the accepted protocol and standard operating procedures.

7.3 GROUNDWATER SAMPLING

To further evaluate and monitor potential exposure to EDB in groundwater, sixteen monitoring wells located downgradient of the leading edge of the FS-28 plume (Figure 7-1) will be sampled and tested for EDB on a quarterly basis. Additionally, the raw water at the Coonamessett Water Supply Well (CWSW) and three upgradient sentry groundwater monitoring wells (69MW1279A, B and C) will also be sampled monthly for EDB analysis. A decision tree is presented in the FS-28 Action Memorandum which outlines a revised sampling strategy if EDB is detected in the water supply well (AFCEE 1997b).

7.4 ECOLOGICAL MONITORING

The FS-28 ecological monitoring of water levels, and physicochemical, chemical, and biological parameters will be used to assess potential adverse impacts to ecosystems from groundwater extraction and the discharge of treated groundwater to the Coonamessett River. Most of the site is actively cultivated cranberry bogs. The water levels in the bogs have been altered by the use of irrigation ditches, culverts, and weirs; the vegetation is also disturbed from the natural state.

This ecological monitoring will be conducted in accordance with the ecological work plan (AFCEE 1998c). The ecological monitoring will be integrated through various aspects of the operation and maintenance program, performance monitoring evaluation program, and risk management objectives.

7.4.1 Ecosystems of Concern

This ecological monitoring plan addresses the following six ecosystems of concern (Figure 7-2 and 7-3):

- the wetland north of Hatchville Road (North Wetland)
- the Coonamessett River
- the Broad River and associated wetland
- the vernal pool (certified pool No. 390)
- the wetland between 69MW1285 and Broad River (69MW1285 Wetland)
- the wetland south of 69SW0024 into which the Coonamessett River flows from the Baptiste bog (South Wetland).

7.4.2 Data Collection

Several rounds of sampling were conducted prior to the start-up of the existing treatment system. Analytical methods for ecological monitoring are presented in Table 5-4 of the ecological work plan (AFCEE 1998c). The list of physicochemical

and chemical parameters for the ecological monitoring ecosystems associated with the FS-28 plume are presented in Table 7-4 of this document.

A weight-of-evidence approach will be used for evaluating lines of evidence to determine if the treatment system is impacting ecological resources. The lines of evidence and the process used to ascertain the relevance and reliability of the data are defined in the ecological work plan (AFCEE 1998b).

7.4.3 Treatment Plant Impact Monitoring

Physicochemical samples will be collected monthly (Figure 7-3) from (1) two groundwater wells (69MW1304 and 69MW1310), (2) one surface water location (69SW0006) upgradient of the 69EW0001 extraction well, (3) from the effluent at the point where the treated water is discharged to the river (69SW0065), and (4) from one surface water monitoring location (69SW0010) downstream of the effluent discharge point. Potential adverse impacts to ecosystems will be determined through comparisons of data from pre-treated groundwater, treated groundwater that is discharged to the river, and surface water downstream of the treatment system. These comparisons will use the weight-of-evidence approach to determine if adverse impacts to ecosystems are groundwater treatment system-related.

Groundwater sampling will be conducted using a low-flow method in accordance with the Groundwater Purging and Sampling Procedure, Low-Flow and Standard Method, TECH-015 (AFCEE 1998a). Surface water sampling will be conducted in accordance with Surface Water Sampling, TECH-017 (AFCEE 1998a).

7.4.4 Water Levels

Water level monitoring will be conducted monthly at 12 monitoring wells and seven piezometers (Table 7-5 and Figure 7-4) to identify changes in groundwater levels resulting from the FS-28 treatment system. In addition, monitoring will include five river discharge locations (69SW0058, 69SW0006, 69SW0046, 69SW0049,

69SW0053) along the Coonamessett River (Figure 7-5). Groundwater level monitoring and surface water level monitoring will be measured in accordance with the Static Water Level and Total Depth Measurement technical procedure, TECH-006, and Stream Gauging, TECH-003 (AFCEE 1998a).

7.4.5 Surface Water and Sediment Sampling

Surface water samples will be collected and analyzed for physicochemical and chemical parameters at six ecosystems of concern to monitor for potential adverse ecological impacts from the groundwater treatment system. Physicochemical parameters in surface water will be measured six times per year. Chemical parameters in surface water will be measured annually except at two locations for which parameters will be measured quarterly. Sediment sampling will be conducted and analyzed for physicochemical and chemical parameters twice. The locations and the sampling frequencies are presented in Table 7-6 and Figure 7-6. Surface water sampling will be conducted in accordance with Surface Water Sampling, TECH-017 (AFCEE 1998a). Sediment samples will be collected using grab samples as described in the technical procedure Sediment Sampling, MMR TECH-022 (AFCEE 1998a).

7.4.6 Biological Sampling

A vegetation survey was completed annually at the six potentially impacted ecosystems prior to start-up of the groundwater treatment system. The locations of the transects and plots are shown in Figure 7-7. After start-up of the groundwater treatment system, annual vegetation surveys will consist of site walks to identify changes in the vegetation at the same locations surveyed for the baseline study. Should changes occur, the weight-of-evidence approach will be used to determine whether the treatment system is the cause of changes. Vegetation surveys will be conducted in accordance with Survey Techniques for Aquatic, Shoreline, and Wetland Vegetation Communities, TECH-032 (AFCEE 1998a).

Although amphibian surveys are specified for vernal pools and wetlands in the ecological work plan (AFCEE 1998b), baseline amphibian surveys were not conducted because the FS-28 Time-Critical Removal Action was initiated too late into the 1997 amphibian season to acquire adequate baseline data. Amphibian surveys will be initiated in 1999.

Preliminary observations of threatened and endangered species and species of special concern (listed species) were made during the baseline vegetation survey. Threatened and endangered species and species of special concern will be observed on annual site walks.

7.5 REPORTING

A technical report will be prepared each quarter. Each report will (1) discuss all sampling and monitoring activities conducted during the previous quarter, (2) summarize all of the data resulting from these activities, (3) discuss any deviations from this monitoring plan or the *Quality Program Plan* (AFCEE 1998a), and (4) evaluate the impact of the treatment system.

8.0 PROJECT MANAGEMENT

Effective management of technical resources, financial budgets, and schedule compliance is the key to a successful project. Project Management's communications with the technical and administrative project team, the regulatory agencies, and the stakeholder is a critical component in the management approach for this task. This section will address the following project management components:

- Project management organization;
- Resources;
- Communication;
- Quality management and nonconformance;
- Site access and control; and
- Work Plan deviations.

8.1 PROJECT MANAGEMENT ORGANIZATION

The organization for project management is shown in Figure 8-1. The team is composed of individuals from AFCEE, the stakeholders, Jacobs, and specialty subcontractors. Responsibilities for key positions are described below.

8.1.1 AFCEE Project Coordinator

The AFCEE Project Coordinator provides oversight of the project, controls funds, and reviews all documents for accuracy and consistency. The AFCEE Project Coordinator is the point of contact for the regulatory agencies and coordinates cleanup activities with base operations. The bog separation project will be under the supervision and management of Ms. Nancy Balkus. All communications will be directed through Ms. Balkus since she is the designated representative for MMR on this project.

8.1.2 Jacobs Program Management

Jacobs' program management includes three key positions: Program Manager, Quality Assurance Manager, and Program Health and Safety Manager. These key positions are described in the following paragraphs.

The Jacobs Program Manager is responsible for the successful completion of the project. The Program Manager is responsible for providing adequate resources, monitoring financial and schedule performance, ensuring that required QC activities have been performed, and ultimately approving project deliverables.

The Jacobs Quality Assurance Manager is responsible for developing and updating the MMR QPP (AFCEE 1998a) to conform with AFCEE, Jacobs, and EPA requirements. He also verifies project compliance to all required QA/QC procedures established in the MMR QPP (AFCEE 1998a). The Quality Assurance Manager coordinates field and laboratory audits and programmatic audits on a periodic basis and reviews all work plans and report deliverables before they go to the Program Manager for review and approval.

The Jacobs Program Health and Safety Manager (PHSM), also known as the Health and Safety Officer (HSO), is responsible for the health and safety of all personnel working on the project sites. The PHSM provides initial health and safety training for all site personnel before field activities begin. Also, the PHSM enforces safety standards and procedures during the implementation of fieldwork, holds daily tailgate meetings, and monitors all health and safety-related site conditions.

8.1.3 Jacobs Project Management

The Jacobs Project Manager, Tom Szymoniak, is responsible for coordinating the technical aspects of the project and managing the budget and schedule. Mr. Szymoniak will orchestrate and integrate various technical disciplines to attain the project objective. He is responsible for ensuring the quality of the work product and that all appropriate QC activities have been performed and documented. Mr.

Szymoniak will communicate with the designated AFCEE representative on a regular basis to discuss project progress, potential constraints, and project work. Mr. Szymoniak reports directly to the operations leads.

8.2 COMMUNICATIONS

Communications is a vital part of any remediation project where a potential risk to the public health and environment exists. Communication between AFCEE and the groups described in the following sections will be stressed.

8.2.1 Contractors

Contractors will conduct meetings or develop status reports on a weekly basis to discuss the progress of the project, projected work, locations of work, the conditions of the budget, the project schedule, and project problems and the their corrective actions.

8.2.2 Regulatory Agencies

AFCEE will communicate with the regulatory agencies both in private, during public meetings, and when the summary progress reports are produced. When necessary, the AFCEE Project Manager will contact the appropriate regulatory agency representative(s) to discuss the MMR project and resolve outstanding issues. This project will be one of those covered in the regular weekly technical update meetings.

8.2.3 Local Stakeholders

Continued community involvement is important to the success of the MMR Program. A community outreach program has been initiated in response to public interviews. AFCEE has developed the MMR Community Involvement Plan (CIP) describing the public communication process for the IRP. This plan will allow for public notification of the cleanup progress at MMR (AFCEE 1998a). Comments received

on the EE/CA during the public comment period or public meeting will be responded to in the Action Memorandum.

8.3 QUALITY MANAGEMENT AND NONCONFORMANCE

The AFCEE/IRP is responsible for ensuring that all IRP activities are conducted in conformance with Air Force policy and quality guidelines. Contractors are subject to the same strict QC requirements. When AFCEE notes noncompliance to required field and QC procedures, the appropriate MMR staff will initiate immediate corrective action. The AFCEE/IRP Manager will be notified of the noncompliance and the planned corrective action.

Jacobs has developed a QPP that describes the programmatic quality guidelines for the MMR program. This plan provides the quality requirements of the overall program.

8.4 SITE ACCESS AND CONTROL

MMR is an active military base and access to sensitive areas is controlled. All subcontracted personnel will contact the AFCEE/IRP Office at least five working days before arrival to allow time for the base to arrange site access.

8.5 WORK PLAN DEVIATIONS

Deviations from the approved Work Plan may occur because of unforeseen conditions in the field. All deviations from approved methodologies and procedures must be approved by AFCEE, the regulatory agencies, and the Jacobs Task Manager or his designee (Field Manager). All Work Plan deviations will be documented as Project Notes with a detailed description of the following:

- Procedure not performed;
- Conditions requiring procedure deviation;
- Implemented change to the procedure; and
- Approval signature and date of the procedure modification.

9.0 REFERENCES

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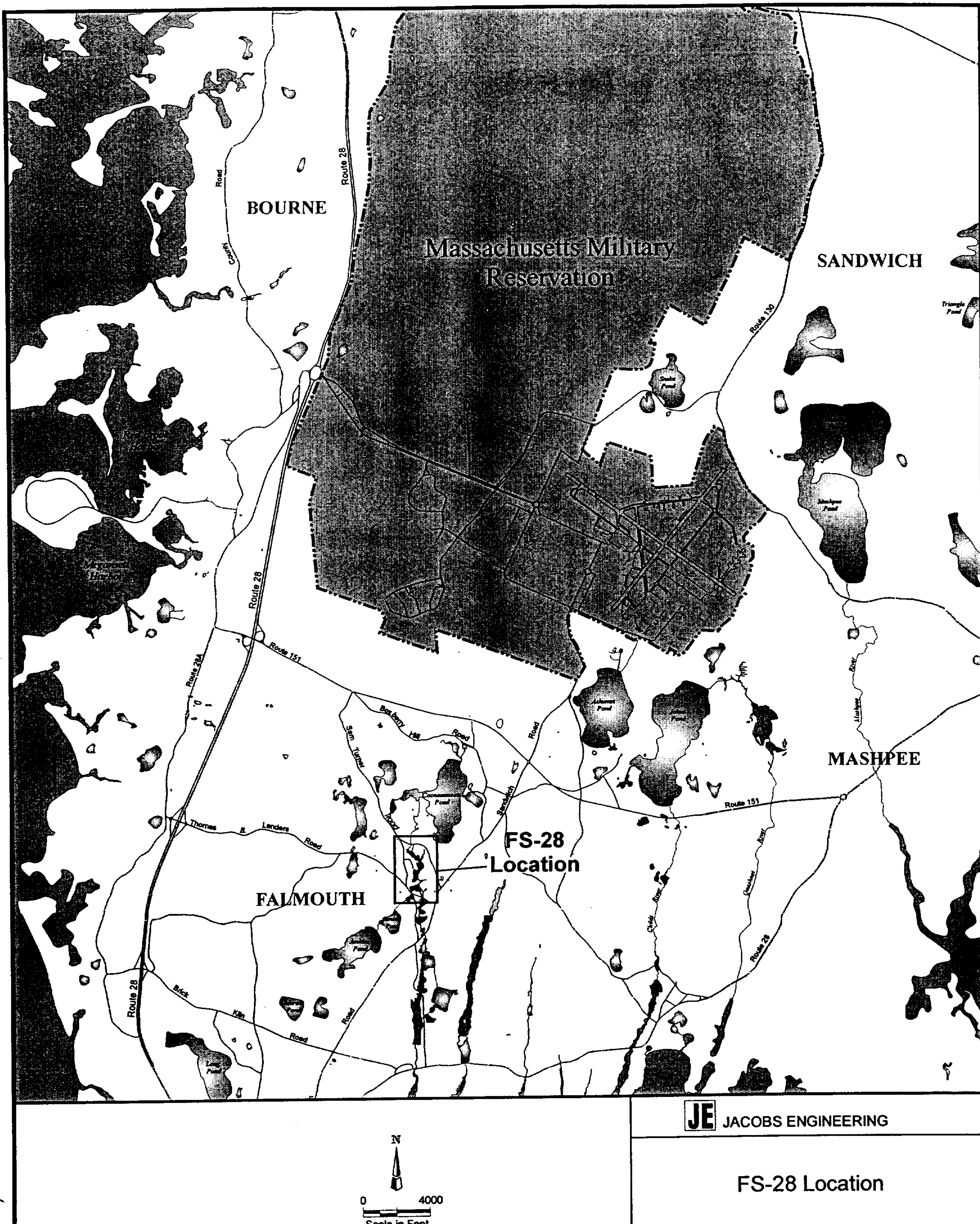
FIGURES



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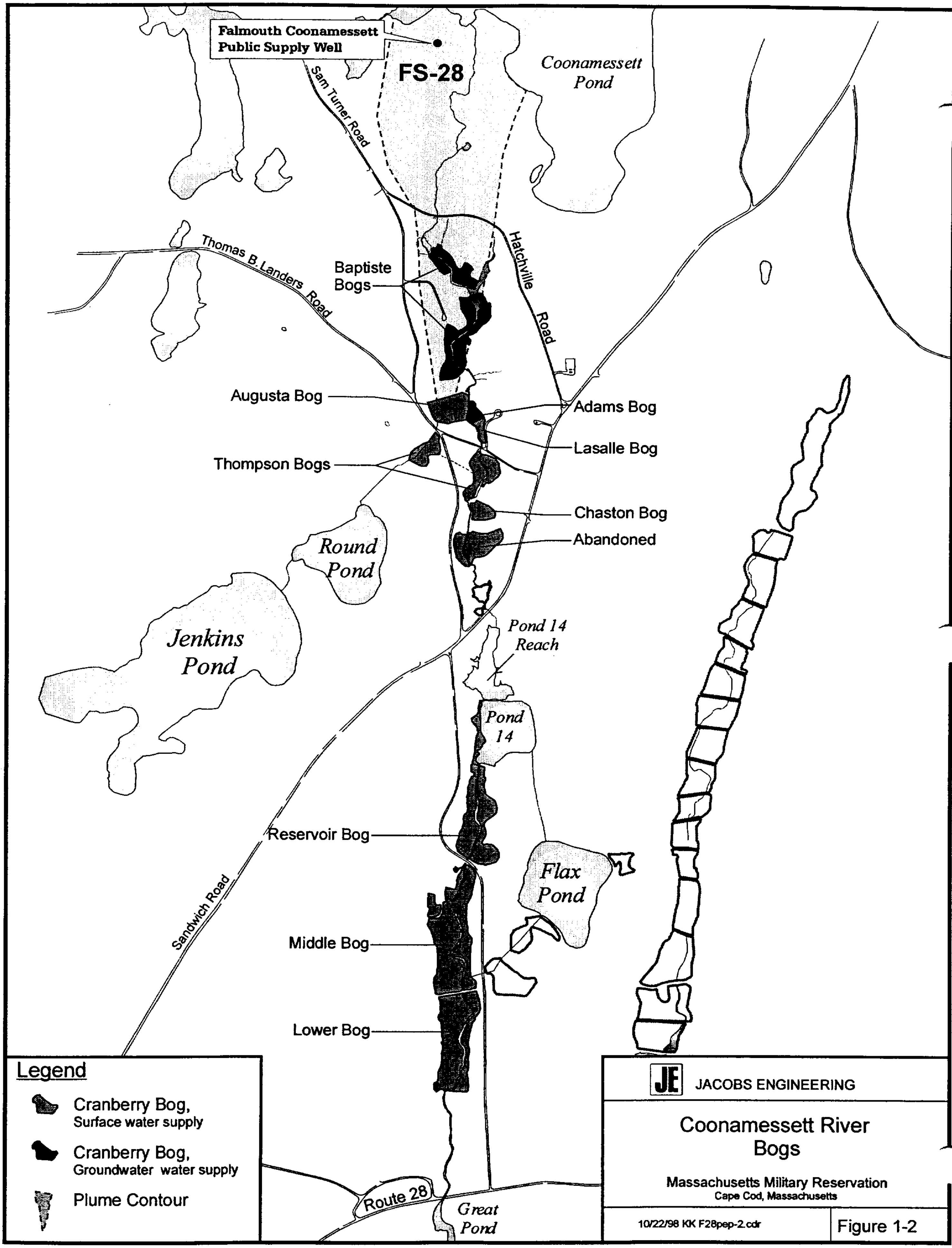
FS-28 Location

Massachusetts Military Reservation
Cape Cod, Massachusetts

10/13/98 sr File:...sw98_1-1.cdr

Figure 1-1



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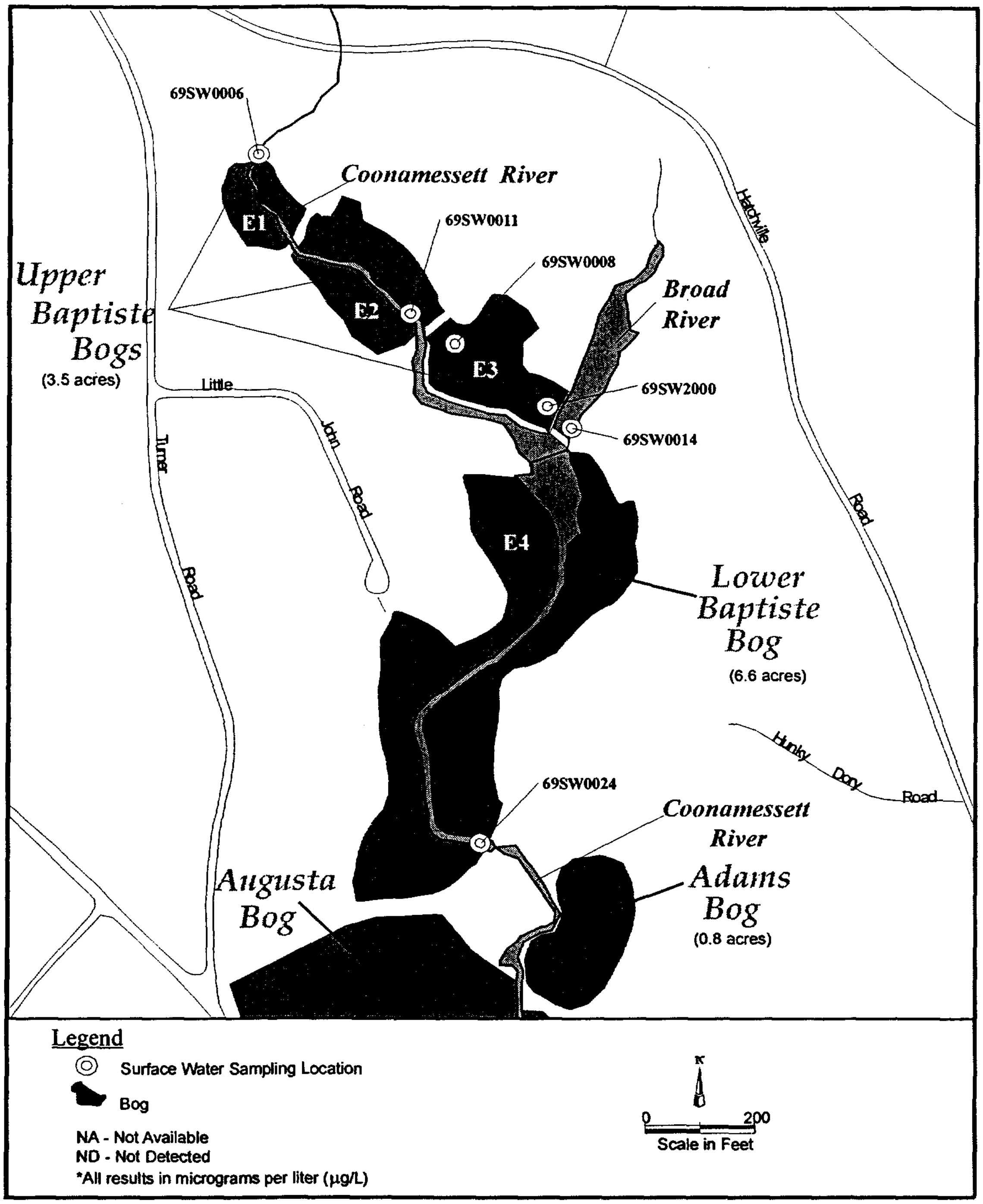
Coonamessett River Bogs

Massachusetts Military Reservation
Cape Cod, Massachusetts

10/22/98 KK F28pep-2.cdr

Figure 1-2



69SW0006	
08/97	ND
09/97	ND
10/97	ND
11/97	ND
12/97	ND
01/98	ND
02/98	ND
03/98	ND
04/98	ND
05/98	ND
07/08/98	ND
07/28/98	ND
08/13/98	ND

69SW0011	
03/98	ND
04/98	ND
05/98	ND
07/08/98	ND
07/28/98	ND

69SW0008	
09/98	0.011

69SW2000	
04/98	0.035
05/98	0.091
07/08/98	0.050
07/28/98	0.033

69SW0014	
07/97	0.210
08/97	0.140
09/97	0.120
10/97	0.026
11/97	0.080
12/97	0.017
01/98	0.018
02/98	0.020
03/98	0.024
04/98	0.066
05/98	0.110
06/98	0.043
07/08/98	0.021
07/28/98	0.021
08/11/98	0.069
09/24/98	0.072
09/25/98	0.102
09/28/98	0.007J
09/30/98	ND

69SW0024	
07/97	0.068
08/97	0.120
09/97	0.077
10/97	ND
11/97	0.062
12/97	0.063
01/98	ND
02/98	ND
03/98	0.059
04/98	0.030
05/98	0.078
07/08/98	0.043
07/28/98	0.043
08/13/98	0.036
09/24/98	0.047
09/25/98	0.069
09/28/98	0.088
09/30/98	0.078

Note: MDEP MCL for Drinking Water = 0.02 µg/L;

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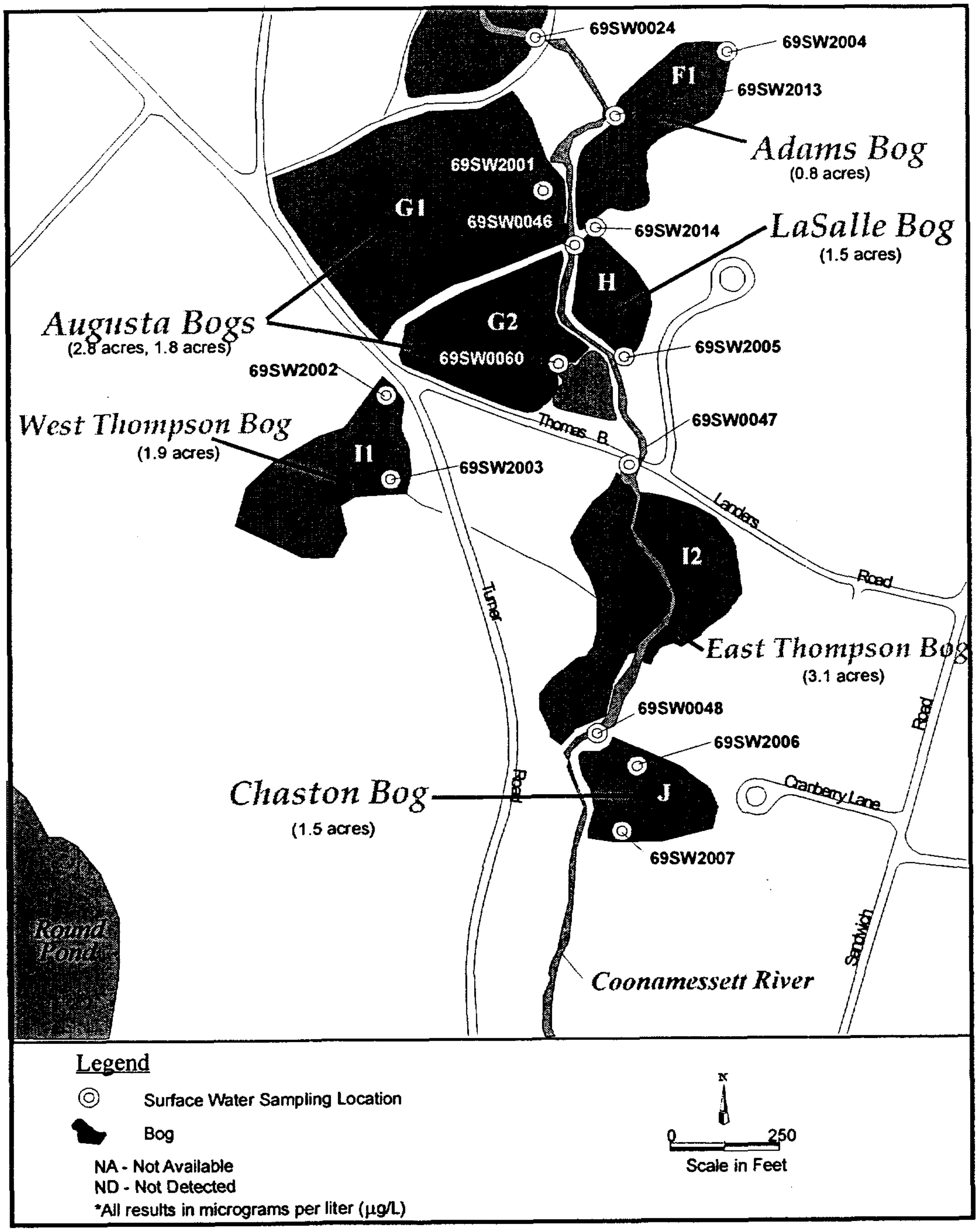
Coonamessett EDB Surface Water Sampling Concentrations

Massachusetts Military Reservation
Cape Cod, Massachusetts

10/22/98 F28pep-3.cdr

Figure 1-3



69SW0024	
06/20/97	0.077
07/17/98	0.100
08/25/97	0.120
09/09/97	0.089
10/07/97	0.098
10/27/97	ND
11/13/97	0.055
12/10/97	0.063
01/29/98	ND
02/19/98	ND
03/16/98	0.045
04/14/98	0.030
05/26/98	0.078
07/08/98	0.043
07/28/98	0.043
08/13/98	0.036
09/24/98	0.047
09/25/98	0.069
09/28/98	0.088
09/30/98	0.078

69SW2005	
04/98	0.036
05/98	0.040
06/98	0.008
07/98	0.011

69SW0047	
07/97	0.053
08/97	0.060
09/97	0.064
10/97	ND
11/97	0.040
12/97	0.014
01/97	ND
02/97	ND
03/97	0.034
04/98	0.016
05/98	0.040
06/98	0.030
07/98	0.029
09/23/98	ND

69SW2006	
07/18/97	ND
08/11/97	ND
09/09/97	ND
10/07/97	ND
11/11/97	ND
12/10/97	ND
01/29/98	ND
02/19/98	ND
03/16/98	ND
04/14/98	ND
05/26/98	ND
07/08/98	0.024
07/29/98	ND
09/01/98	ND
09/23/98	ND

69SW2004	
04/98	ND
05/98	ND
06/98	ND
07/98	ND

69SW2013	
04/98	0.044
05/98	0.044
06/98	0.031
07/98	0.030

69SW2014	
07/17/97	0.250
08/13/97	0.196
09/16/97	0.120
10/07/97	0.049
11/11/97	0.080
12/10/97	0.017
01/29/98	0.018
02/19/98	0.020
03/16/98	0.024
04/01/98	ND
05/26/98	0.110
07/08/98	0.010
07/29/98	0.034

69SW0048	
04/98	0.033
05/98	0.037
06/98	ND
07/98	0.028
09/01/98	0.035
09/23/98	0.041

69SW2007	
04/98	ND
05/98	ND
06/98	ND
07/98	ND
09/01/98	ND
09/23/98	ND

69SW0046	
07/97	0.064
08/97	0.100
09/97	0.074
10/97	ND
11/97	0.053
12/97	0.022
01/98	ND
02/98	ND
03/98	0.040
04/98	0.026
05/98	ND
06/98	0.035
07/98	0.033
08/98	0.048

69SW2001	
04/98	ND
05/98	ND
06/98	ND
07/98	ND

69SW0060	
07/97	ND
08/97	ND
09/97	ND
10/97	ND
04/98	ND
05/98	ND
06/98	ND
07/98	ND

69SW2002	
04/98	NA
05/98	NA
06/98	ND
07/98	ND
08/98	ND
09/23/98	ND

69SW2003	
04/98	ND
05/98	ND
06/98	ND
07/98	ND
08/98	ND
09/23/98	ND

Note: MDEP MCL for Drinking Water = 0.02 µg/L;

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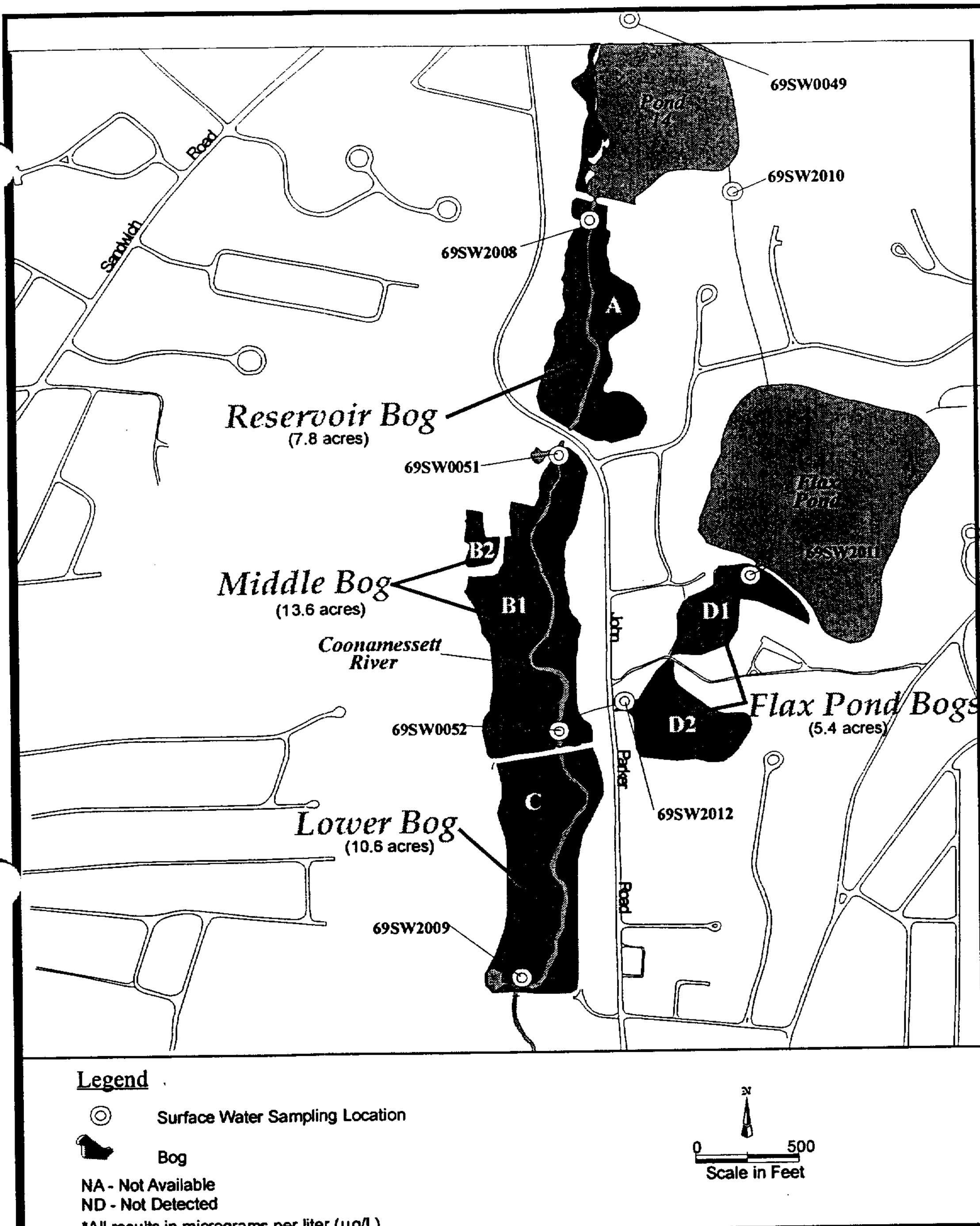
Coonamessett EDB Surface Water Sampling Concentrations

Massachusetts Military Reservation
Cape Cod, Massachusetts

10/22/98 F28pep-4.cdr

Figure 1-4



69SW0049

07/14/97	0.038
08/12/97	0.040
09/10/97	0.048
10/17/97	ND
11/13/97	0.016
12/10/97	0.026
01/29/98	ND
02/19/98	ND
03/16/98	0.019
04/14/98	0.014
05/26/98	NA
07/08/98	NA
07/29/98	0.023
09/24/98	ND
09/25/98	ND
09/28/98	ND
09/30/98	0.027

69SW0051

08/97	0.007
09/97	0.019
10/97	ND
11/97	ND
12/97	0.012
01/98	ND
02/98	ND
03/98	ND
04/98	ND
05/98	0.012
06/98	ND
07/98	0.006
08/98	0.009
09/23/98	0.005

69SW0052

11/96	ND
12/96	ND
01/97	ND
02/97	ND
03/97	0.009
04/97	ND
04/98	ND
05/98	ND
06/98	ND
07/98	ND
08/98	ND
09/23/98	ND

69SW2011

04/98	ND
05/98	ND
06/98	ND
07/98	ND
08/98	ND
09/23/98	ND

69SW2012

04/98	ND
05/98	ND
06/98	ND
07/98	ND
08/98	ND
09/23/98	ND

69SW2009

04/98	ND
05/98	ND
06/98	ND
07/98	ND
08/98	0.006J
09/23/98	ND

69SW2010

04/98	0.0130
05/98	0.0110
06/98	ND
07/98	NA

69SW2008

04/98	0.011
05/98	0.015
06/98	ND
07/98	0.00
08/98	0.011
09/23/98	0.007

Note: MDEP MCL for Drinking Water = 0.02 µg/L;

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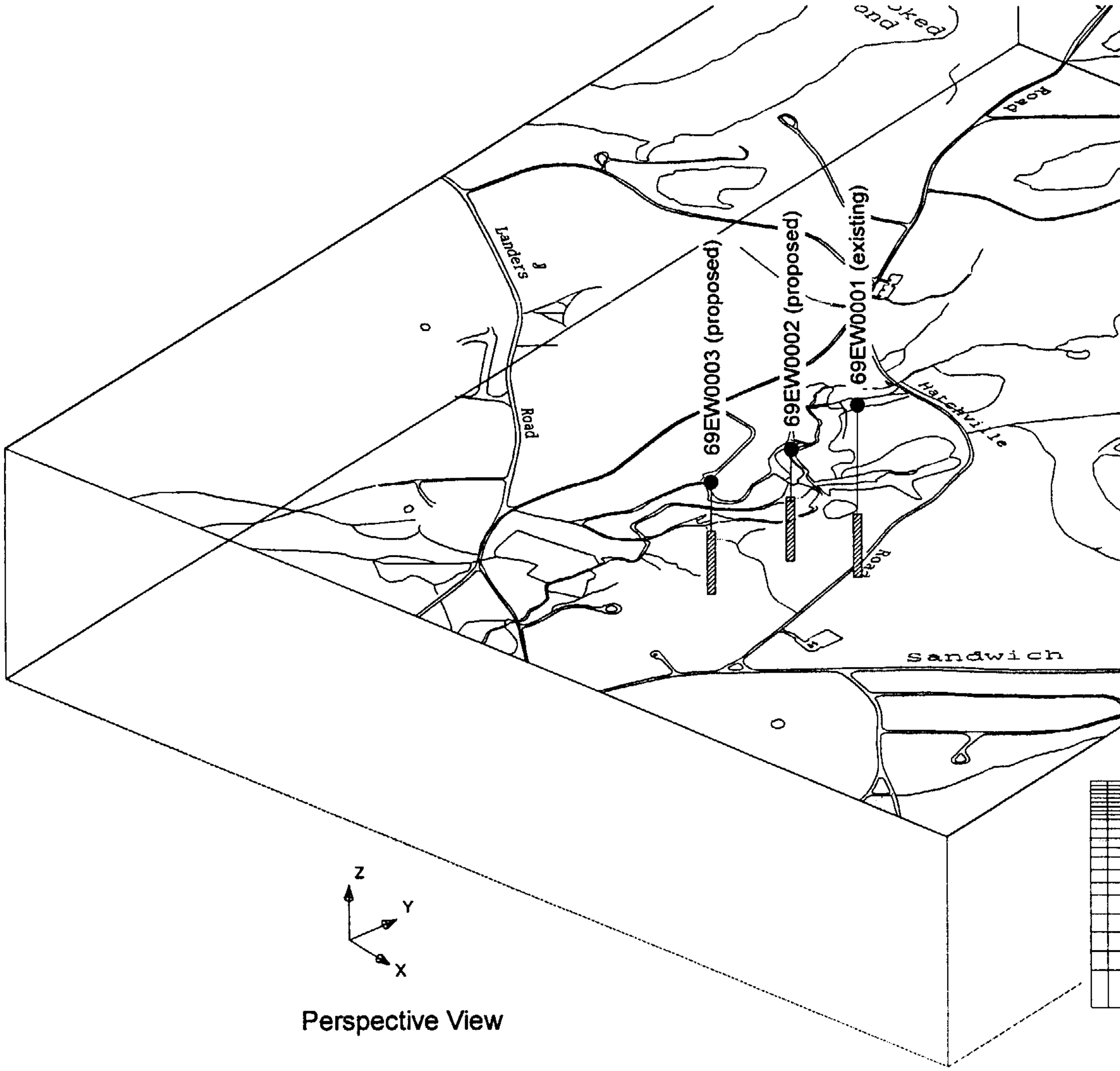
Coonamessett EDB Surface Water Sampling Concentrations

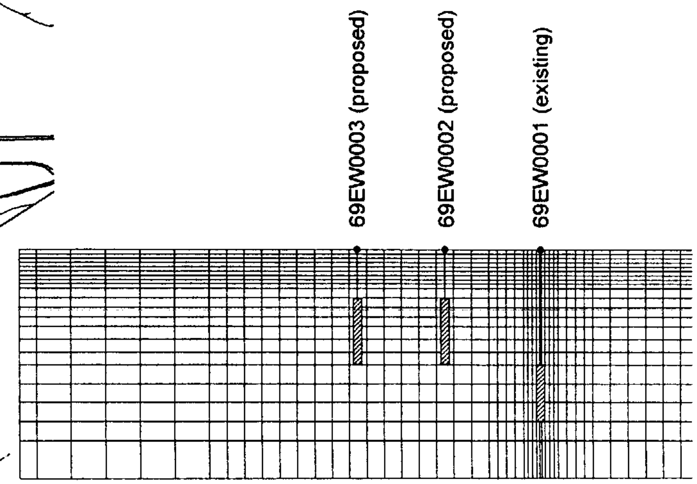
Massachusetts Military Reservation
Cape Cod, Massachusetts

10/22/98 F28pep-5.cdr

Figure 1-5



Perspective View



Side View (y-z)

Legend

Extraction well showing approximate screen depth

Extraction Well	Easting	Northing	Elevation	Model Layer
69EW0001 (existing)	853233	224250	-108 to -169	17-19
69EW0002 (proposed)	853356	223714	-23 to -97	11-16
69EW0003 (proposed)	853350	223198	-23 to -97	11-16

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Locations of Extraction Wells and Proposed Screen Intervals for Pumping Scenarios

Massachusetts Military Reservation
Cape Cod, Massachusetts

3/9/98 DW File:NewWells.cdr

Figure 1-6

TOWN SELECT/POLITICAL APPT.

- Nancy Caffyn, Select - Town of Mashpee
- Bob Whritenour, Exec. Sec. Town of Mashpee
- Virginia Valiela, Select - Town of Falmouth
- Peter Boyer, Falmouth Town Administrator
- Betsy McEvoy, Sen Kerry's Office
- Steve Kerrigan, Sen Kennedy's Office
- Mark Forest, Rep Delahunt's Office
- Jim Quin, Foothill Engineering, Selectmen's Consultant
- Everyone Deserves Better, EDB Neighborhood Coalition
- Gail MacRae/Brian McDermott, Homeowner/Attorney
- Patrick Field, The Consensus Building Institute, Inc.

CONSERVATION COMMISSIONS

- Bob Sherman, Mashpee Conservation Commission
- Diane Boretos, Mashpee Conservation Commission
- Jo Ann Muramoto, Falmouth Conservation Commission
- Allan Gordon, Chair Bog Cmte, Falmouth Conservation Commision
- Paul Montague, Falmouth Shellfish/Herring Constable
- Mark Patton, Falmouth Natural Resources
- David Potter, Chairman, Falmouth Conservation Comm.
- Ray Jack, Water District Superintendent, Falmouth Water District
- Dana Smith/Tina Dolan, The 300 Committee, Land Acquisition
- Bruce Tripp, Bog Subcommittee, Coastal Research Lab

CRANBERRY INDUSTRY

- Jeff LaFleur, Cape Cod Cranberry Growers Assoc.
- Emily Sperling, Cape Cod Cranberry Growers Assoc.
- Brian Handy, Handy Cranberry Trust
- Dan Augusta, Cranberry Bog Owner/Grower
- Tom Adams, Cranberry Bog Owener/Grower
- Bill Chaston, Cranberry Bog Owner/Grower
- Nancy Lassalle, Cranberry Bog Owner
- Marc Garrett, Nancy Lassalle's Consultant
- Tom Bewick/Frank Caruso, UMass Cranberry Experimental Station
- William Franz/Dr. Tom Bicki, Ocean Spray
- Jack Crooks, Ocean Spray Grower Relations

STATE

- George Crombie, Mass. Exec. Office of Env. Affairs
- Paul Taurasi, MDEP
- Len Pinaud, MDEP RPM
- Cathy Kiley, MDEP
- Marcel Boelitz, MDEP
- Elizabeth Kouloheras, MDEP Wetlands
- Suzanne Condon/Elaine Krueger, MDPH
- Greg Braun, MDPH
- Julianne Nassif, Director, State Laboratory Institute
- Steve Hurley, MA Div of Fisheries & Wildlife
- Ken Reback, MA Div. of Marine Fisheries
- Joel Lerner, EOEA, Leasing Attorney
- Jay Healy, Food & Agriculture Commissioner
- Joe Costa, Buzzard Bay Project

FEDERAL

- Frank Ciavattieri, EPA
- Mary Sanderson, EPA
- Paul Marchessault, EPA RPM
- Mike Jasinski, EPA (Alt. RPM)
- Bob Lim, EPA
- Matt Schweisberg, EPA-OEP (Wetlands)
- Steve DiMattei, EPA
- Joan Miles, EPA Attorney
- Dave Pincumbe, EPA-OEP (NPDES)
- Dick Willey, EPA
- Steve Spear, USDA-NRCS
- Don Liptak, USDA-NRCS

MMR

- Col (Sel) Ron Coke, AFCEE/ER
- Jim Lyon/Dave McMindes, AFCEE/ERD
- Jim Snyder, AFCEE/MMR, RPM
- Mike Minior, AFCEE/MMR, Deputy RPM
- Bud Hoda, AFCEE/MMR, FS-1 Project Manager
- Marty Aker, AFCEE/MMR, FS-28 Project Manager
- Dr. Andy Anders, AFCEE/ERC
- Nancy J. Balkus, AFCEE/ERD, Cranberry Project Coordinator
- Tom Szymoniak, Jacobs Engineering
- Laurie Ekes, Jacobs Engineering
- Donald Schall, ENSR/Jacobs
- Dr. Kang Xia, Kansas State University
- Mark Escobar/Shari Fritz, UNITEC
- Matt Gamache/Tara King, Worcester Polytechnical Institute

- Lt Col Ray Knight, AF/ILEVR
- Johnny Davis, AF/ILEVR
- Fred Kuhn/Larry Groner, General Counsel
- Col Richard Tobin/Jay McCain, AFLSA/JACE
- Lt Col EG Willard/Bill Dick, AFCEE/JA
- Bill Edwards/Julie Talbot, Air Force Real Estate Agency
- Carl Pavetto, Joint Program Office
- Lt Col Barbara Larcom, Joint Program Office
- Joanne Watson, Army Reserve National Guard
- Dave Hill, Army Reserve Nat'l Guard/Bregmar
- Maureen McCabe, Army Corps of Engineers Attorney
- Mary Dunn, Army Corps of Engineers Appraiser
- Ray Cottengaim, Army Corps of Engineers Real Estate
- Ted Lento/Karen Adams, Army Corps of Engineers, 404 Permit

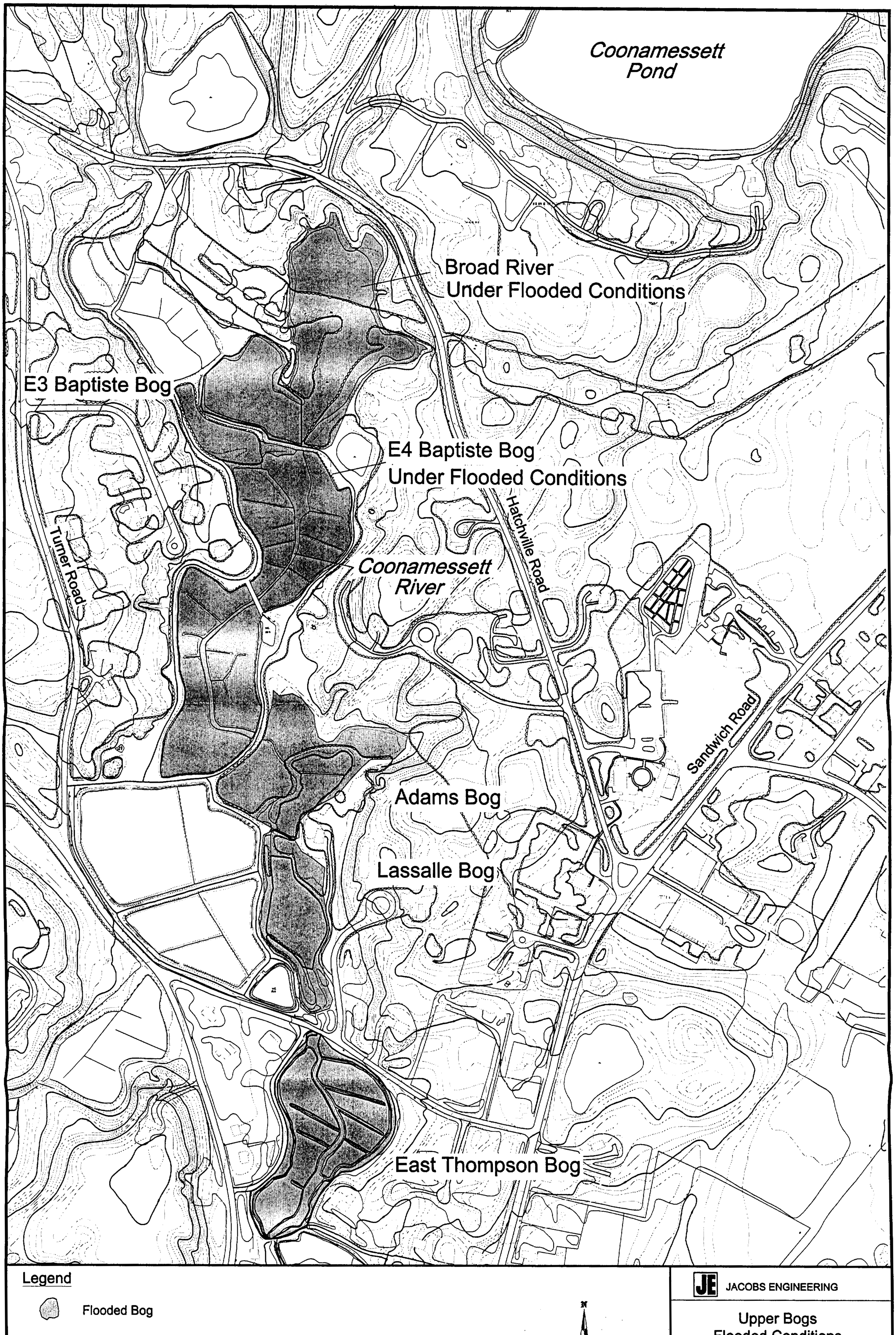
JE JACOBS ENGINEERING

MMR
Cranberry Stakeholders

Massachusetts Military Reservation
Cape Cod, Massachusetts

10/27/98 kk F28bog-1.cdr

Figure 3-1



Legend

Flooded Bog

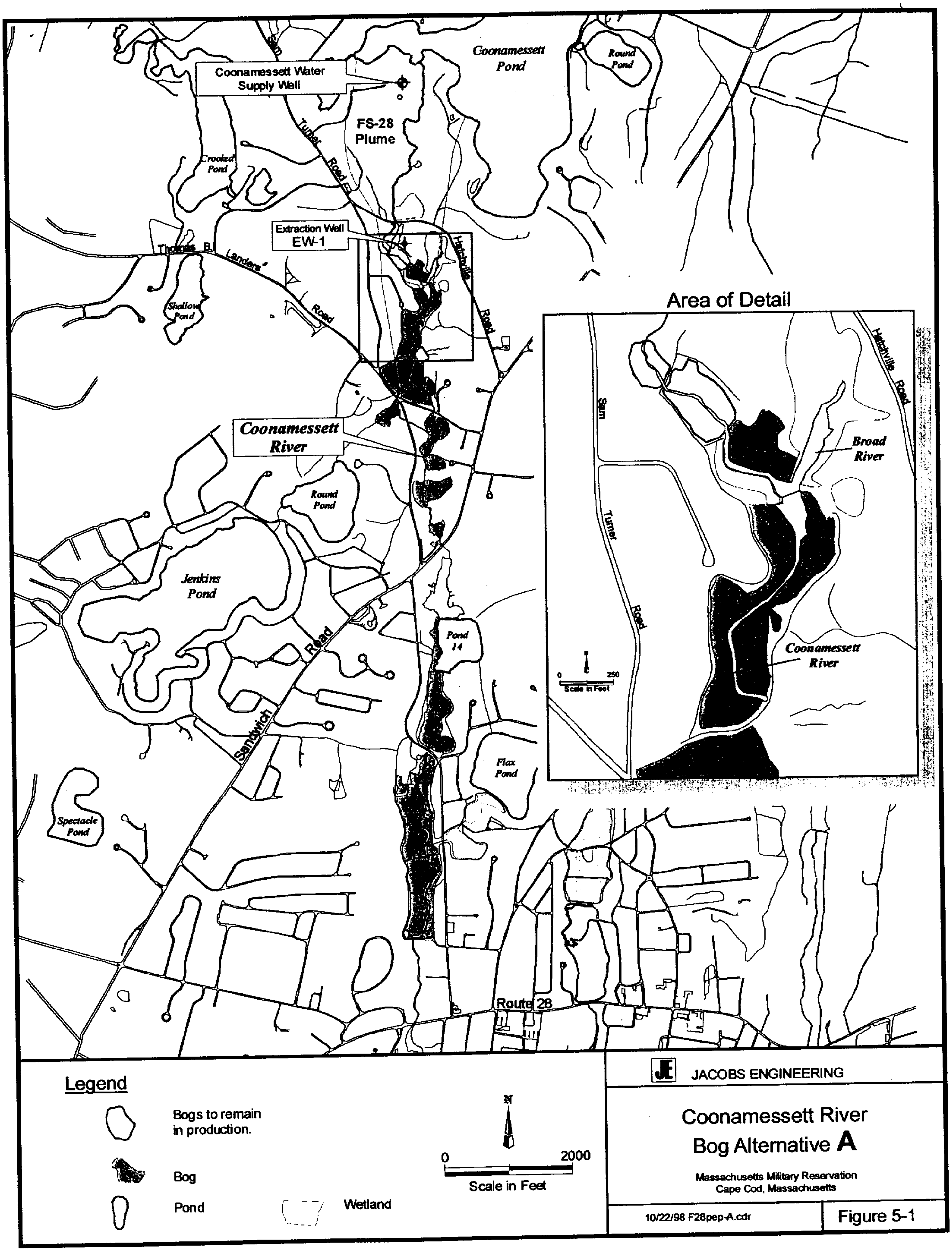
JACOBS ENGINEERING

Upper Bogs
Flooded Conditions

Massachusetts Military Reservation
Cape Cod, Massachusetts

11/25/98 SR File...28bogfld.dwg

Figure 4-1



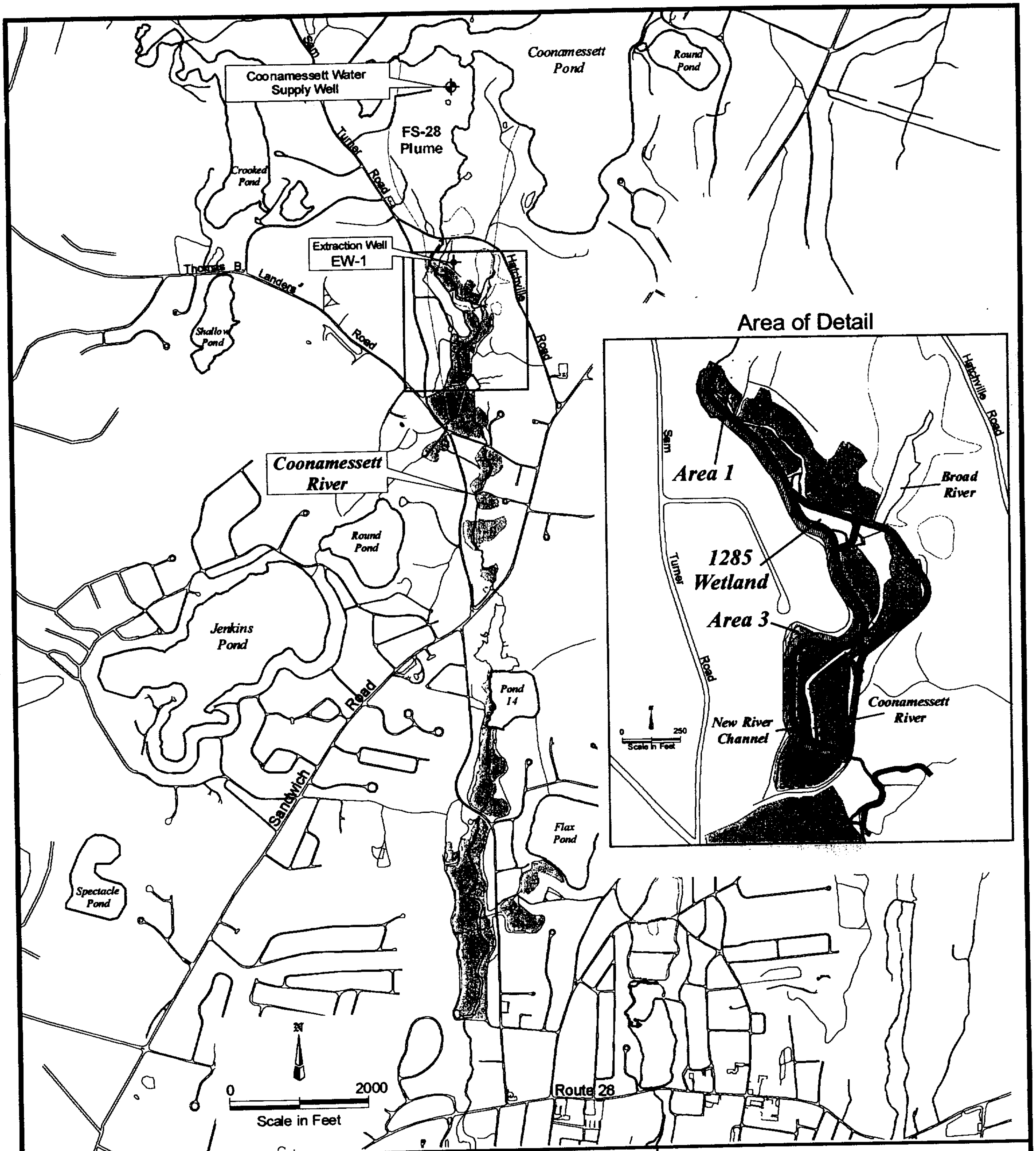
JACOBS ENGINEERING

Coonamessett River
Bog Alternative A

Massachusetts Military Reservation
Cape Cod, Massachusetts

10/22/98 F28pep-A.cdr

Figure 5-1



Legend

Berm

Bog

Pond

Wetland

0 2000

Scale in Feet

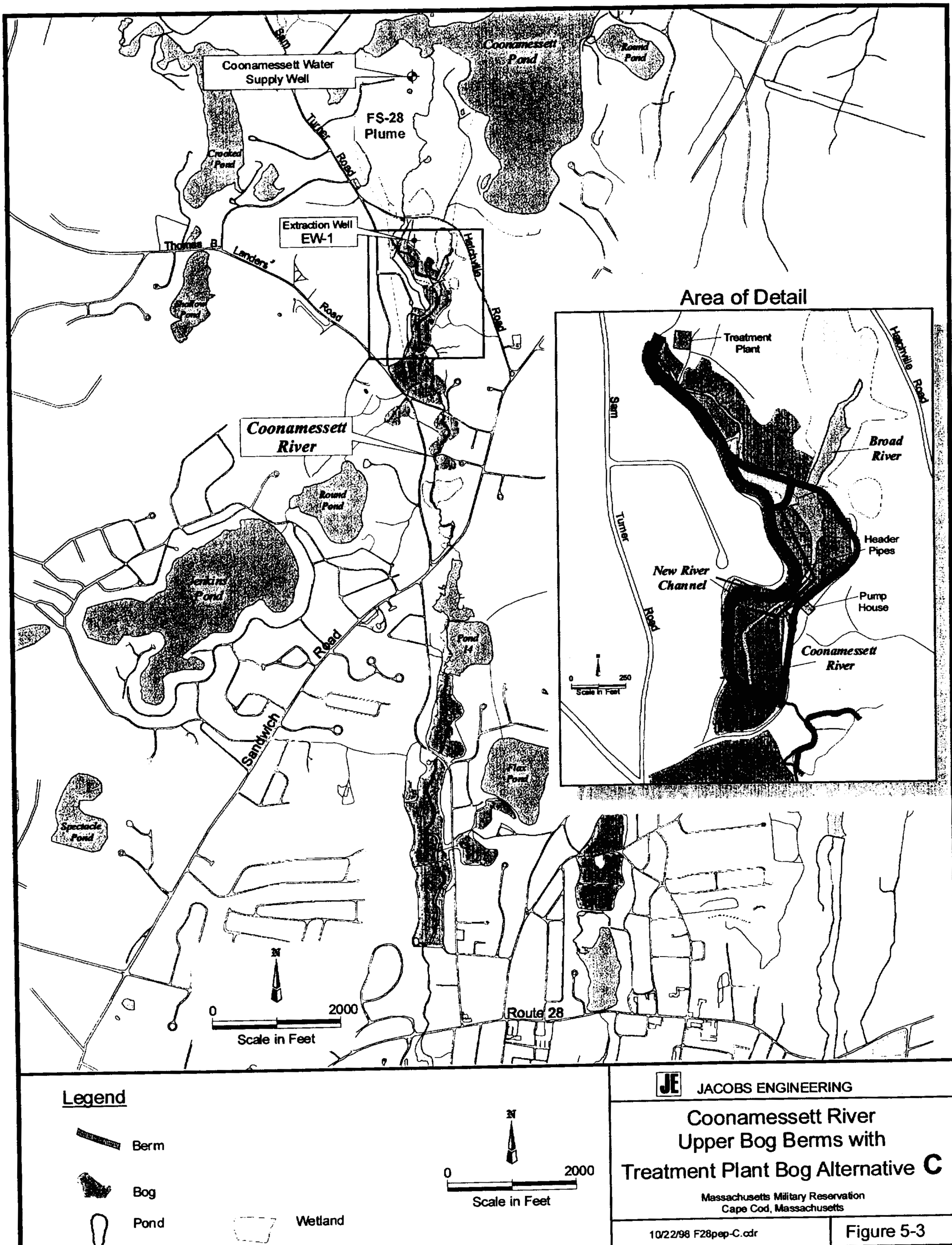
JACOBS ENGINEERING

Coonamessett River
Berm Upper Bogs
Bog Alternative B

Massachusetts Military Reservation
Cape Cod, Massachusetts

10/22/98 F28pep-B.cdr

Figure 5-2



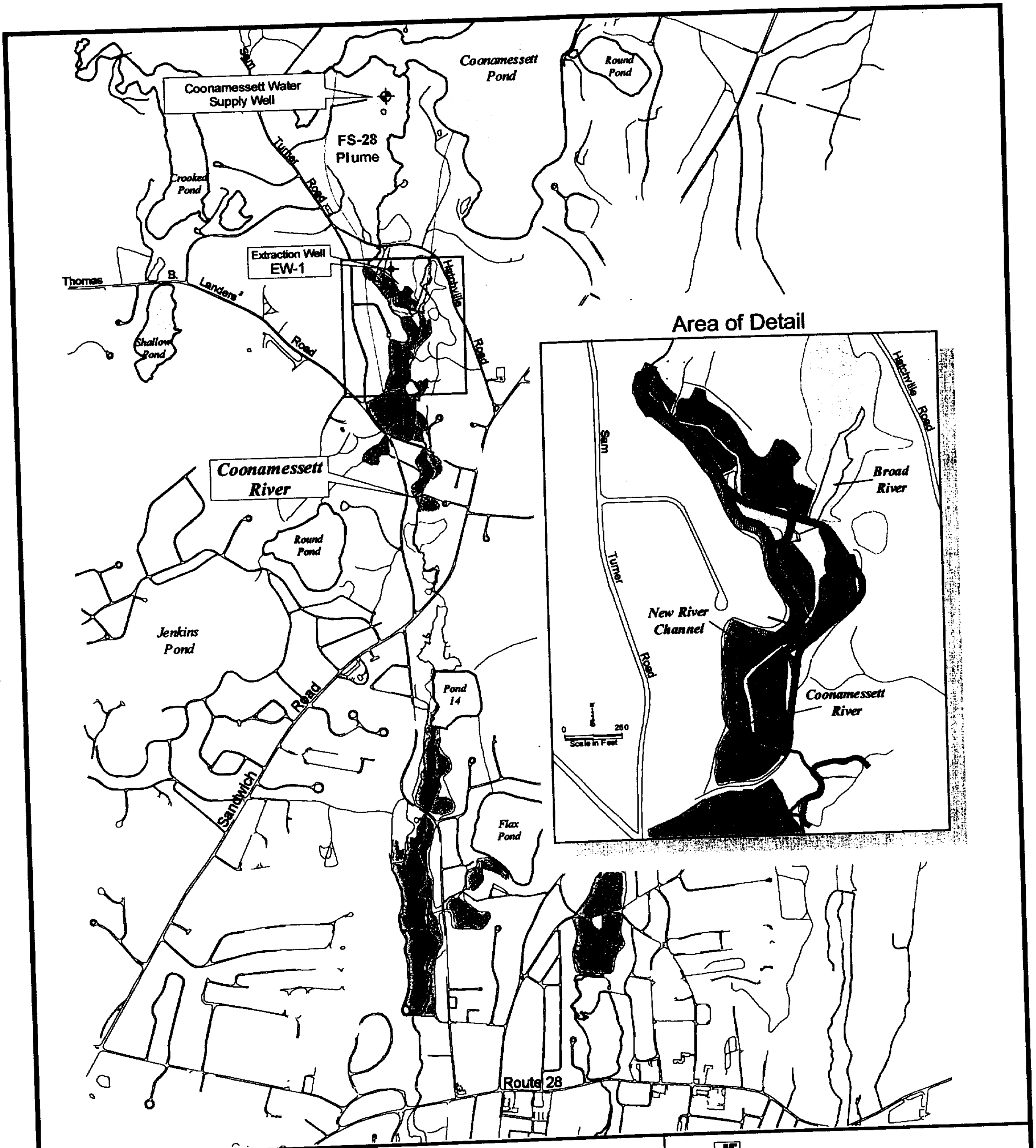
JE JACOBS ENGINEERING

Coonamessett River
Upper Bog Berms with
Treatment Plant Bog Alternative **C**

Massachusetts Military Reservation
Cape Cod, Massachusetts

10/22/98 F28pep-C.cdr

Figure 5-3



Legend

Berm

Isolation Berm

Bog

Pond

Wetland

0 2000

Scale in Feet

JE JACOBS ENGINEERING

Coonamessett River
Separate All Bogs
Alternative **D**

Massachusetts Military Reservation
Cape Cod, Massachusetts

10/22/98 F28pep-C.cdr

Figure 5-4

FS-28 Coonamessett River

Upper Baptiste Bog (E1): 0.5 acres
- Surface water data non-detect
- Continue collecting surface water data

Upper Baptiste Bog (E2): 1.5 acres
- Surface water data non-detect
- Continue collecting surface water data

Upper Baptiste Bog (E3): 1.5 acres
- Berm east end of bog E3 to isolate from Broad River
- Install 2 new flumes
- Continue collecting surface water data

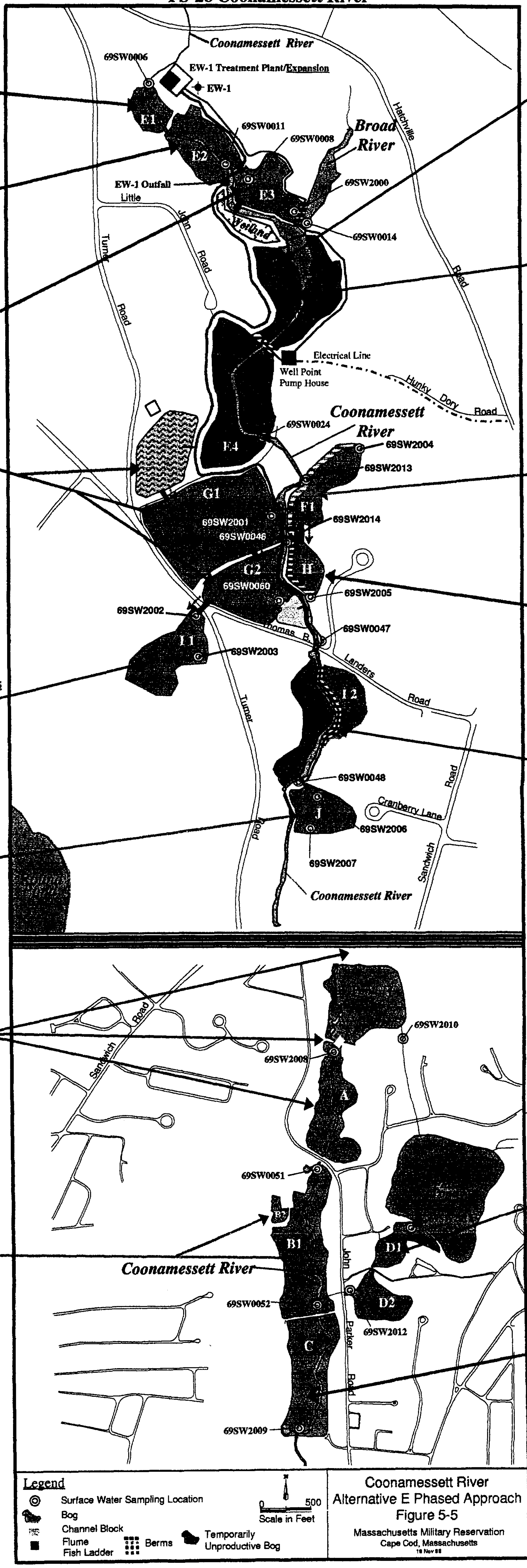
Augusta Bogs (G1): 4.8 acres (G2): 1.8 acres)
- Surface water data non-detect
- Bog is already separated from river.
- Provide alternate water source from EW-1 pipeline
- Develop a 1 acre (6' depth) reservoir for water storage
- Continue collecting surface water data

West Thompson Bog (I1): 1.9 acres
- Surface water data non-detect
- Bog is already separated from river.
- Provide alternate water source from EW-1 pipeline through Augusta bog
- Continue collecting surface water data

Chaston Bog (J): 1.5 acres
- Surface water data non-detect
- Bog is already separated from river
- Provide alternate water source from EW-1 pipeline
- Eliminate water loss from bog
- Continue collecting surface water data

Reservoir Bog (A): 7.8 acres
- Conduct tracer test at inlet to Pond 14
- Improve fish ladder at outlet of Pond 14
- Continue collecting surface water data

Middle Bog (B1 & B2): 13.6 acres
- Continue collecting surface water data



Lower Baptiste Bog (E4): 6.6 acres
- Conducted Shallow Well-Point Pilot Test in upper corner of bog
- Expand well-point extraction system to full-scale (168 points)
- Reduce EW-1 pump rate to 400 gpm
- Treat well-point captured flow with remaining capacity of 350-400 gpm at EW-1 Treatment Plant
- Install berm across middle of lower baptiste bog
- Continue Collecting Surface Water Data
- If expanded well-point system does not achieve 10-fold decrease using 400 gpm, expand EW-1 treatment plant system, may require 1000 to 1800 gpm expansion of the current EW-1 Treatment Plant.

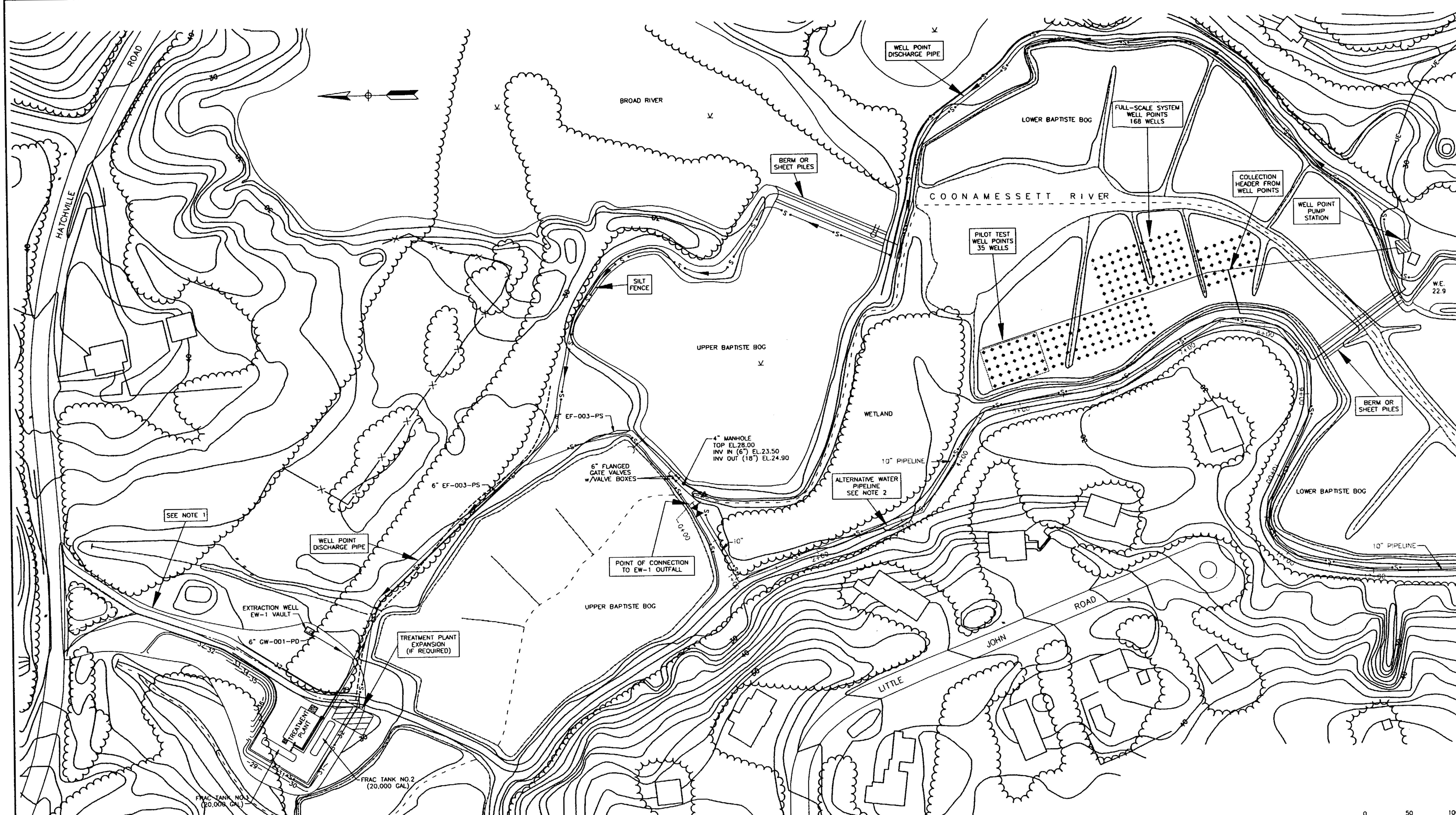
Adams Bog (F1): 1.05 acres
- Install berm or sheet piling on west side of bog to separate it from the river
- Provide alternate water source from EW-1 pipeline
- Continue collecting surface water data

Lassalle Bog (H): 1.5 acres
- Install berm or sheet piling on west side of bog to separate it from the river
- Provide alternate water source from EW-1 pipeline,
- Continue collecting surface water data

East Thompson Bog (I2): 3.1 acres
- Berm east side of river channel
- West side temporarily taken out of production
- East side remains cranberry bog
- Provide alternate water source from EW-1 pipeline
- Continue to collect surface water data

Flax Pond Bogs (D1 & D2): 5.4 acres
- Improve flume at Flax Pond outlet
- Continue Collecting Surface Water Data
- Test Berries, Market FY98

Lower Bog (C): 10.6 acres
- Surface water data non-detect
- Continue collecting surface water data



NOTES:

1. TREATMENT PLANT LAYOUT AND CONTOURS AS SHOWN ON JACOBS ENGINEERING DRAWING FS28-1045-001. CONTOURS TIE INTO CONTOURS GENERATED BY A SEPARATE SURVEY PERFORMED DURING TREATMENT PLANT DESIGN. CONTOURS SHOWN OUTSIDE TREATMENT PLANT AREA ARE BASED ON ARIEL PHOTOGRAPHY DATE MAY 14 1997.

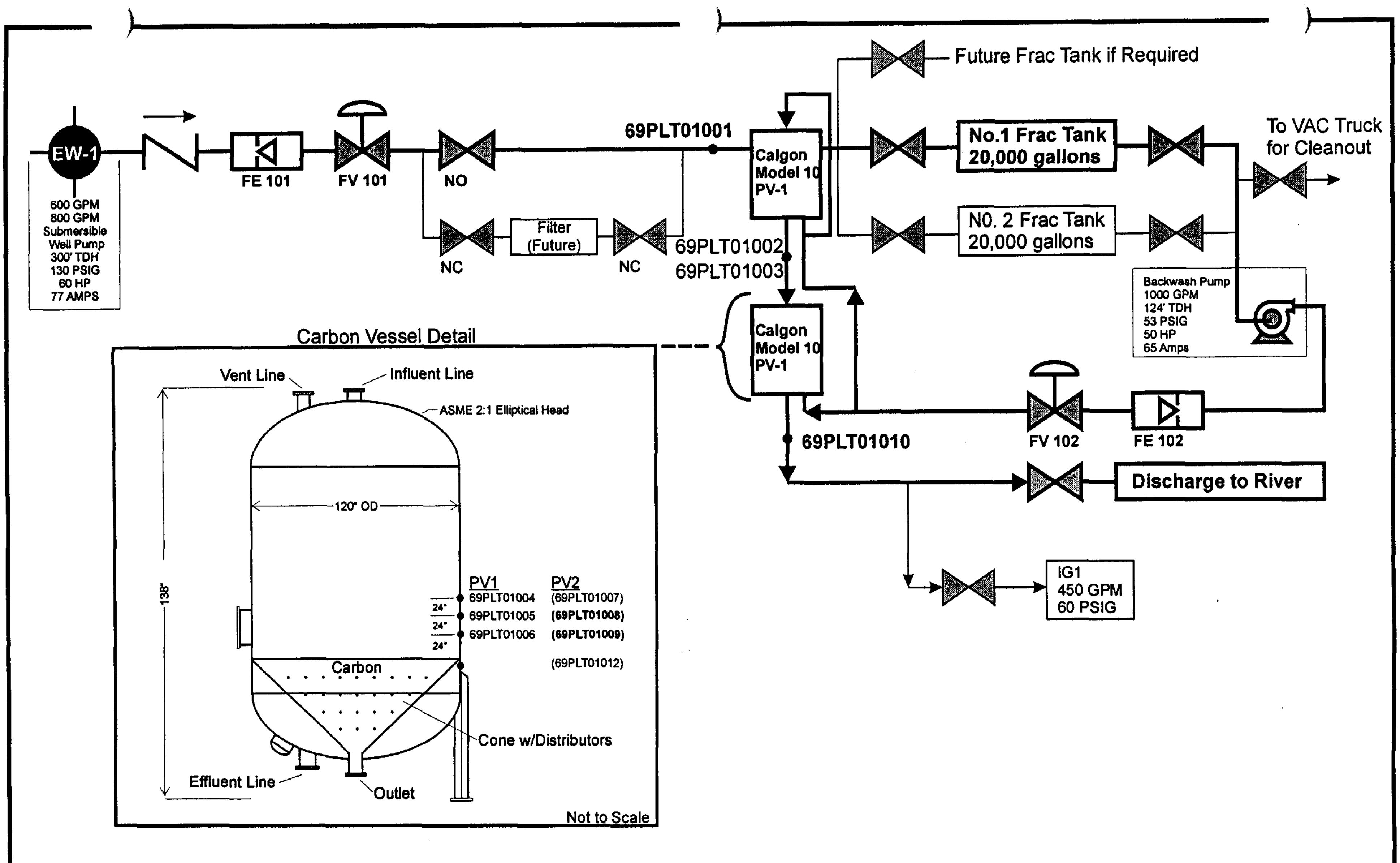
2. LAYOUT OF ALTERNATIVE WATER PIPELINE AS SHOWN ON G.A.F. ENGINEERING DRAWING TITLED, PLAN OF WATERLINE CONSTRUCTION/IMPROVEMENTS, JOB NO. 98-4355.

REFERNCE DRAWING

FS28-1045-001 MMR PLUME RESPONSE PROJECT, FUEL SPILL-28 PLUME, SITE PLAN

JACOBS ENGINEERING	
BOG SEPARATION PROJECT COONAMESSETT RIVER SITE PLAN MASSACHUSETTS MILITARY RESERVATION Cape Cod, Massachusetts	
DATE 10-19-98	FIGURE 6-1

C:\SHARE\8210-02\8210F003.DWG DEL 10-19-98



Legend

- Flow Measurement
- Valve
- Check Valve
- Sample Port

Note:
1. Sample points as indicated on table 2.
2. Manually set flow of backwash pump to match flow into Frac Tank.

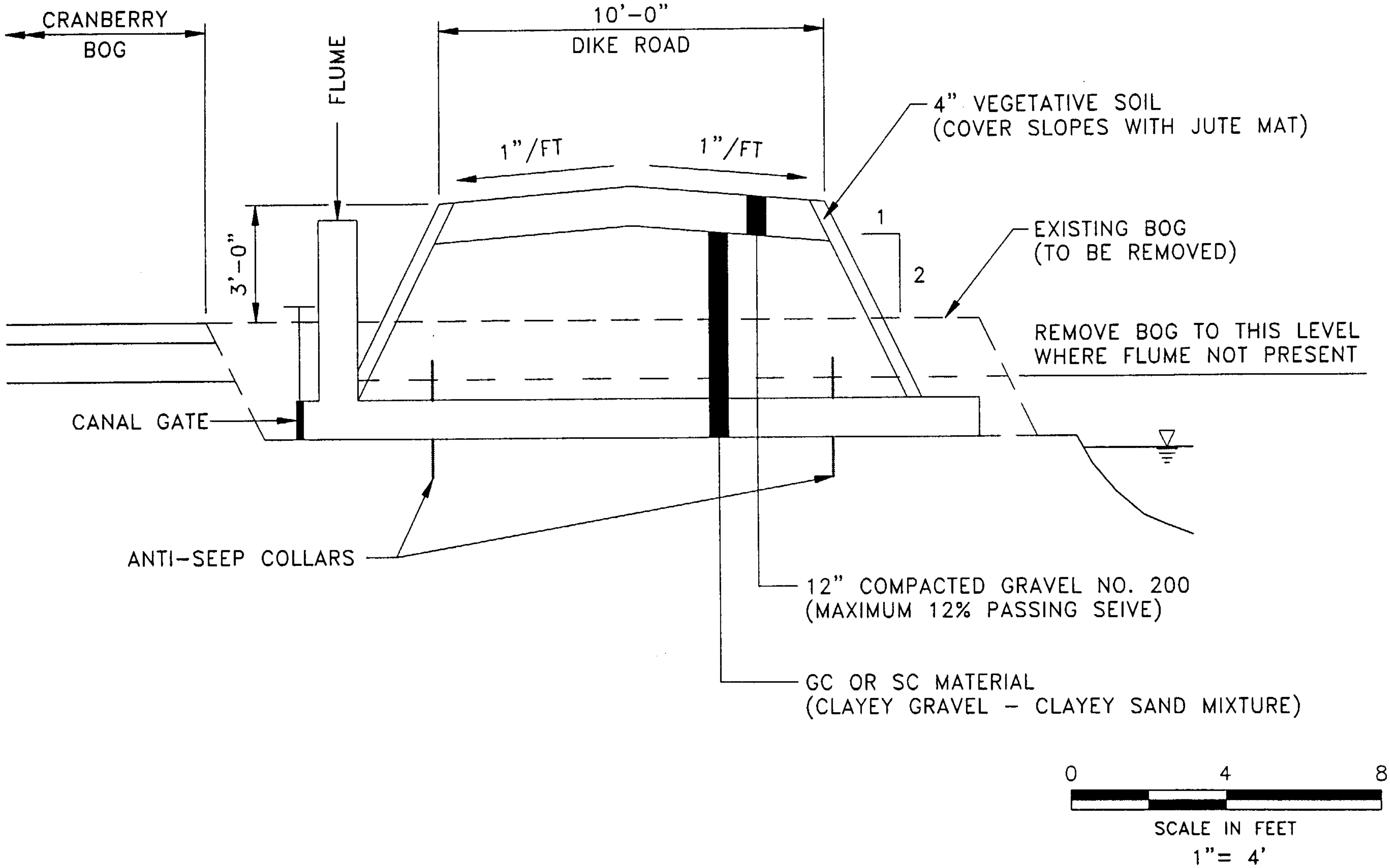
JE JACOBS ENGINEERING

FS-28 Treatment Plant
Process Flow Diagram

Massachusetts Military Reservation
Cape Cod, Massachusetts

10/13/98 SR sw98-2-6.cdr

Figure 6-2



JACOBS ENGINEERING

BOG SEPARATION PROJECT
COONAMESSETT RIVER
BERM DETAIL (OPTION 1)

MASSACHUSETTS MILITARY RESERVATION
Cape Cod, Massachusetts

PROJ. NO.	DATE	
–	10-19-98	FIGURE 6-3

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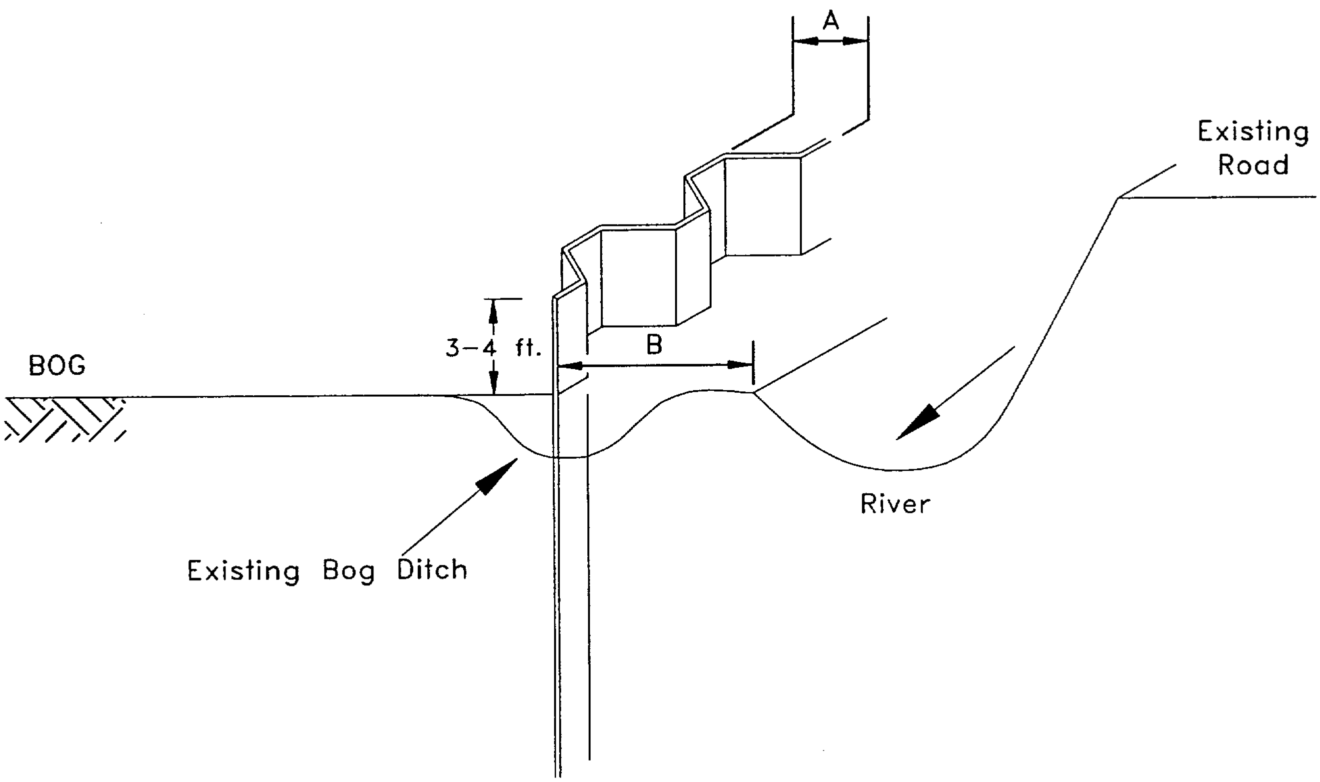


A = WIDTH TAKEN UP BY SHEET PILE
(SHEET PILE WIDTH <1 FT)

B = MINIMUM SETBACK FROM RIVER
(AREA REQUIRED TO PROVIDE GUIDE TO ALIGN SHEETS) (3-10 FT)

0 4 8

SCALE IN FEET
1"= 4'

JE JACOBS ENGINEERING

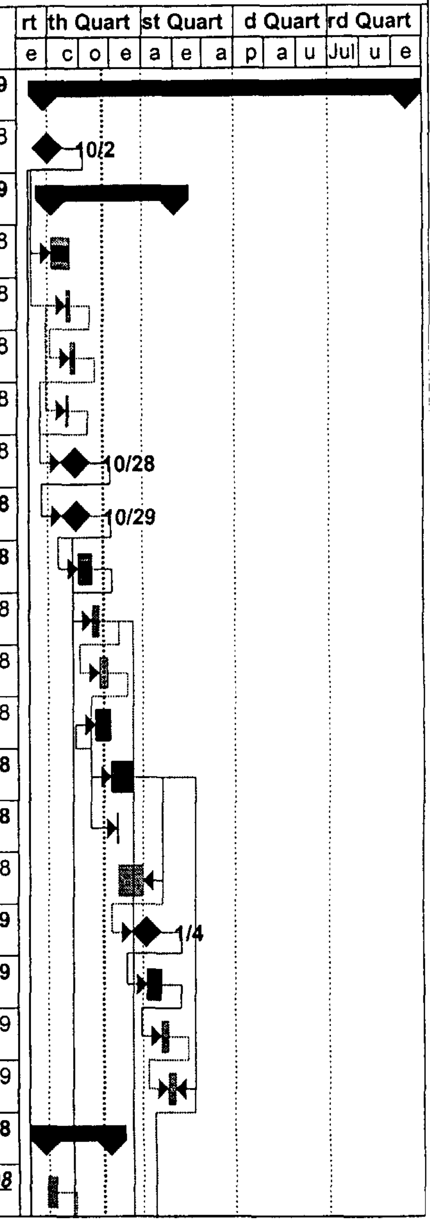
BOG SEPARATION PROJECT
COONAMESSETT RIVER
VINYL SHEET PILE DETAIL
(OPTION 2)

MASSACHUSETTS MILITARY RESERVATION
Cape Cod, Massachusetts

Revision	DATE	FIGURE 6-4
(kk 11/25/98)	10-19-98	

G:\SHARE\9210-02\9210F001.DWG DEL 10-19-98

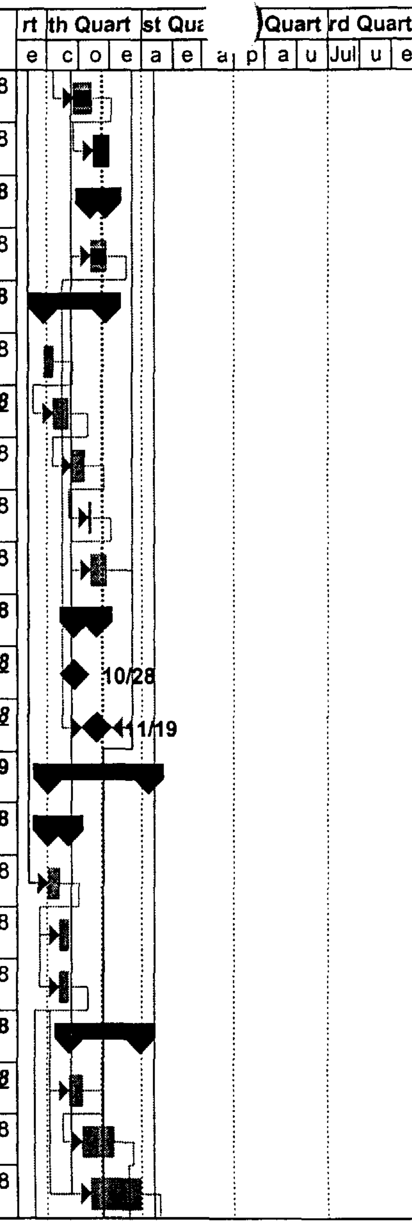
ID		Task Name	Duration	Start	Finish
1		**Coonamessett River Bogs**	**248 days**	**Mon 9/28/98**	**Wed 9/15/99**
2	✓	Notice to Proceed (Change Notices)	0 days	Fri 10/2/98	Fri 10/2/98
3		**Coonamessett Execution Plan/EECA/Action Memorandum**	**81 days**	**Mon 10/5/98**	**Mon 2/1/99**
4	✓	Prepare Preliminary Project Execution Plan (PEP)/EECA	14 days	Mon 10/5/98	Thu 10/22/98
5	✓	Internal Peer Review PEP/EECA	4 days	Mon 10/19/98	Thu 10/22/98
6	✓	Revise PEP/EECA	3 days	Fri 10/23/98	Tue 10/27/98
7	✓	Technical Editing PEP/EECA	2 days	Mon 10/19/98	Tue 10/20/98
8	✓	Reproduction of PEP/EECA	0 days	Wed 10/28/98	Wed 10/28/98
9	✓	**Submit Draft PEP/EECA to Agencies**	**0 days**	**Thu 10/29/98**	**Thu 10/29/98**
10		**Regulatory Review of PEP/EECA**	**10 days**	**Fri 10/30/98**	**Thu 11/12/98**
11		AFCEE Respond to Regulatory Comments	5 days	Fri 11/13/98	Thu 11/19/98
12		Resolve Comments/Issue Memorandum of Resolution	5 days	Fri 11/20/98	Fri 11/27/98
13		Prepare EECA Fact Sheet	10 days	Mon 11/16/98	Mon 11/30/98
14		**Informal Public Comment Period on EE/CA PEP (Response Plan) & Fact Sheet**	**21 edays**	**Mon 11/30/98**	**Mon 12/21/98**
15		**Public Information Meeting during Informal Comment Period**	**1 day**	**Mon 12/7/98**	**Mon 12/7/98**
16		Prepare Draft Action Memorandum	15 days	Tue 12/8/98	Thu 12/31/98
17		**Submit Draft Action Memorandum**	**0 days**	**Mon 1/4/99**	**Mon 1/4/99**
18		**Regulatory Review of Action Memo**	**10 days**	**Tue 1/5/99**	**Mon 1/18/99**
19		AFCEE Respond to Regulatory Comments	5 days	Tue 1/19/99	Mon 1/25/99
20		Resolve Comments/Issue Memorandum of Resolution	5 days	Tue 1/26/99	Mon 2/1/99
21		**Data Gap Investigation Tasks**	**45 days**	**Mon 9/28/98**	**Mon 11/30/98**
22		***Pond 14 RDA Submital and Hearing***	***7 days***	***Tue 9/29/98***	***<u>Wed 10/7/98</u>***



Project: Bog Separation Project
Last Update: 11/16/98

Task		Rolled Up Task		Project Summary	
Progress		Rolled Up Milestone	◇	Split	
Milestone	◆	Rolled Up Progress		Rolled Up Split	
Summary		External Tasks			

ID	Indicators	Task Name	Duration	Start	Finish
23	✓	Conduct clearing at Pond 14	14 days	Tue 10/27/98	Fri 11/13/98
24		Conduct tracer test	10 days	Mon 11/16/98	Mon 11/30/98
25	✓	**Drilling**	**10 days**	**Fri 11/13/98**	**Fri 11/27/98**
26	✓	Hollow-stem auger - Coonamessett	10 days	Fri 11/13/98	Fri 11/27/98
27		**Shallow Well Pilot Test**	**44 days**	**Mon 9/28/98**	**Fri 11/27/98**
28		Pilot Test Work Plan	7 days	Mon 9/28/98	Tue 10/6/98
29		***Pilot Test Well RDA Submittal & Hearing***	***11 days***	***Wed 10/7/98***	***Wed 10/21/98***
30		Mobilization & Set Wells	10 days	Mon 10/26/98	Fri 11/6/98
31	✓	Conduct Pilot Tests	2 days	Wed 11/11/98	Thu 11/12/98
32		Prepare and Submit Test Report	10 days	Fri 11/13/98	Fri 11/27/98
33		**Coonamessett Stakeholder Meetings**	**16 days**	**Wed 10/28/98**	**Thu 11/19/98**
34		***Public Meeting on Coonamessett Alternatives***	***0 days***	***Wed 10/28/98***	***Wed 10/28/98***
35	✓	***Stakeholder Meeting - Validate assumptions, new data***	***0 days***	***Thu 11/19/98***	***Thu 11/19/98***
36		**Engineering/Pre-Construction Tasks**	**65 days**	**Fri 10/2/98**	**Thu 1/7/99**
37		**Bog Engineering**	**14 days**	**Fri 10/2/98**	**Wed 10/21/98**
38		Property Surveying	7 days	Fri 10/2/98	Mon 10/12/98
39		Alternative Water - Pipeline	7 days	Tue 10/13/98	Wed 10/21/98
40		Design berms	7 days	Tue 10/13/98	Wed 10/21/98
41		**Permits**	**45 days**	**Fri 10/23/98**	**Wed 12/30/98**
42		***Preferred Alternative NOI Submittal and Hearing***	***9 days***	***Fri 10/23/98***	***Wed 11/4/98***
43		Order of Conditions	21 days	Thu 11/5/98	Fri 12/4/98
44		Submittal and Review of 404 Category II Programmatic General Permit	30 days	Fri 11/13/98	Wed 12/30/98



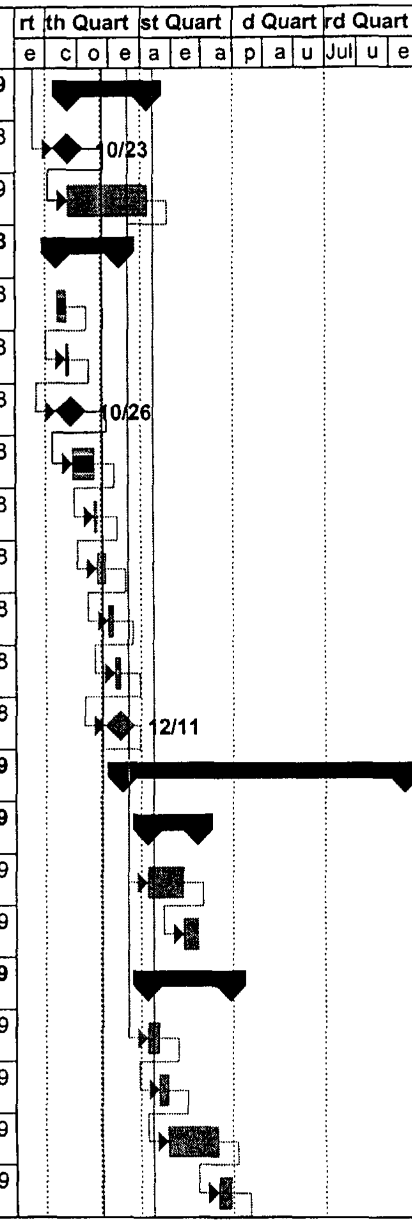
Project: Bog Separation Project
Last Update: 11/16/98

Task	Rolled Up Task	Project Summary
Progress	Rolled Up Milestone	Split
Milestone	Rolled Up Progress	Rolled Up Split
Summary	External Tasks	

Meeting/Hearing Date

Completion Milestones
Figure 6-5

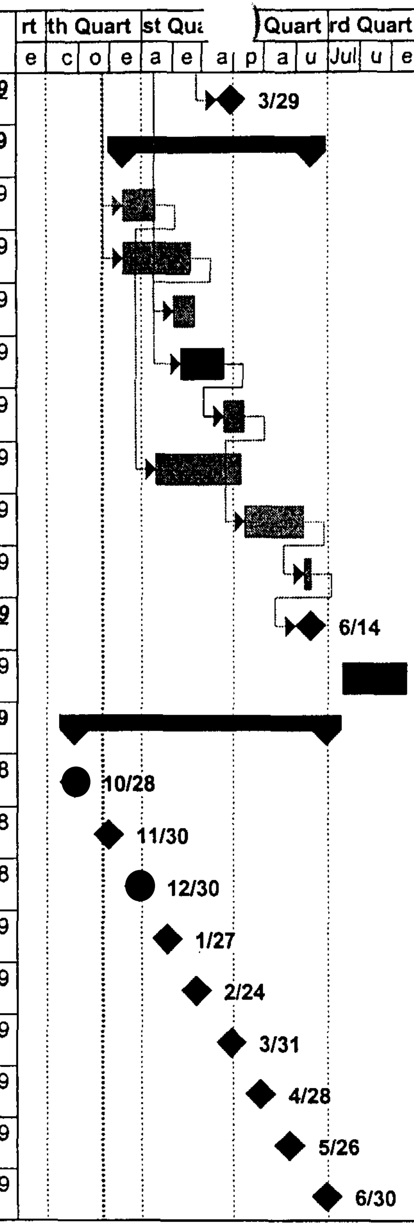
ID	Indicators	Task Name	Duration	Start	Finish
45		**Property Access**	**50 days**	**Fri 10/23/98**	**Thu 1/7/99**
46	✓	Planning Report Submitted from USACE	0 days	Fri 10/23/98	Fri 10/23/98
47		Prepare Easements	50 days	Fri 10/23/98	Thu 1/7/99
48		**Construction Contract Procurement**	**44 days**	**Mon 10/12/98**	**Fri 12/11/98**
49	✓	Gov't SOW/Cost Estimate	7 days	Mon 10/12/98	Tue 10/20/98
50	✓	Contracting Review SOW/Estimate	3 days	Wed 10/21/98	Fri 10/23/98
51	✓	Issue Request for Proposal	0 days	Mon 10/26/98	Mon 10/26/98
52	✓	Prepare Proposal	15 days	Tue 10/27/98	Mon 11/16/98
53		Technical Evaluation	3 days	Tue 11/17/98	Thu 11/19/98
54		Pricing Evaluation	5 days	Fri 11/20/98	Fri 11/27/98
55		Pre-Negotiation Prep/Negotiations	5 days	Mon 11/30/98	Fri 12/4/98
56		Complete Contract File/Contract Award	5 days	Mon 12/7/98	Fri 12/11/98
57		Notice to Proceed	0 days	Fri 12/11/98	Fri 12/11/98
58		**Construction Tasks**	**194 days**	**Mon 12/14/98**	**Wed 9/15/99**
59		**Alternate Water Source (Adams, Lassalle, Thompson, Chaston, Augusta)**	**35 days**	**Fri 1/8/99**	**Thu 2/25/99**
60		Construct pipeline	25 days	Fri 1/8/99	Thu 2/11/99
61		Restore Site	10 days	Fri 2/12/99	Thu 2/25/99
62		**Berms (Baptiste, Adams, Lassalle, E. Thompson)**	**57 days**	**Fri 1/8/99**	**Mon 3/29/99**
63		Mobilization	7 days	Fri 1/8/99	Mon 1/18/99
64		Install Erosion & Sediment	7 days	Tue 1/19/99	Wed 1/27/99
65		Construct Berms & Flumes	35 days	Thu 1/28/99	Wed 3/17/99
66		Restore site	8 days	Thu 3/18/99	Mon 3/29/99



Project: Bog Separation Project
Last Update: 11/16/98

Task		Rolled Up Task		Project Summary	
Progress		Rolled Up Milestone		Split	
Milestone		Rolled Up Progress		Rolled Up Split	
Summary		External Tasks			

ID		Task Name	Duration	Start	Finish
67		***Coonamessett Berm Construction Complete***	***0 days***	***Mon 3/29/99***	***Mon 3/29/99***
68		**Full-Scale Well Points & Treatment System Expansion (if needed)**	**127 days**	**Mon 12/14/98**	**Mon 6/14/99**
69		Finalize design	20 days	Mon 12/14/98	Thu 1/14/99
70		Order GAC units	45 days	Mon 12/14/98	Thu 2/18/99
71		Mobiilze equipment & materials	15 days	Tue 2/2/99	Mon 2/22/99
72		Install additional well points & pumping equipment	30 days	Tue 2/9/99	Mon 3/22/99
73		Construct Foundation	15 days	Tue 3/23/99	Mon 4/12/99
74		Primary Power	60 days	Fri 1/15/99	Thu 4/8/99
75		Expand Treatment Plant (additional 600-1000gpm)	40 days	Tue 4/13/99	Mon 6/7/99
76		System Start Up	5 days	Tue 6/8/99	Mon 6/14/99
77		***Coonamessett Treatment Plant Complete***	***0 days***	***Mon 6/14/99***	***Mon 6/14/99***
78		Construct Pond 14 Fish Ladder	45 days	Thu 7/15/99	Wed 9/15/99
79		**Coonamessett Monthly Surface Water Sampling**	**170 days**	**Wed 10/28/98**	**Wed 6/30/99**
80	✓	October 98	0 days	Wed 10/28/98	Wed 10/28/98
81		November 98	0 days	Mon 11/30/98	Mon 11/30/98
82		December 98	0 days	Wed 12/30/98	Wed 12/30/98
83		January 99	0 days	Wed 1/27/99	Wed 1/27/99
84		February 99	0 days	Wed 2/24/99	Wed 2/24/99
85		March 99	0 days	Wed 3/31/99	Wed 3/31/99
86		April 99	0 days	Wed 4/28/99	Wed 4/28/99
87		May 99	0 days	Wed 5/26/99	Wed 5/26/99
88		June 99	0 days	Wed 6/30/99	Wed 6/30/99



Project: Bog Separation Project
Last Update: 11/16/98

Task		Rolled Up Task		Project Summary	
Progress		Rolled Up Milestone		Split	
Milestone		Rolled Up Progress		Rolled Up Split	
Summary		External Tasks			

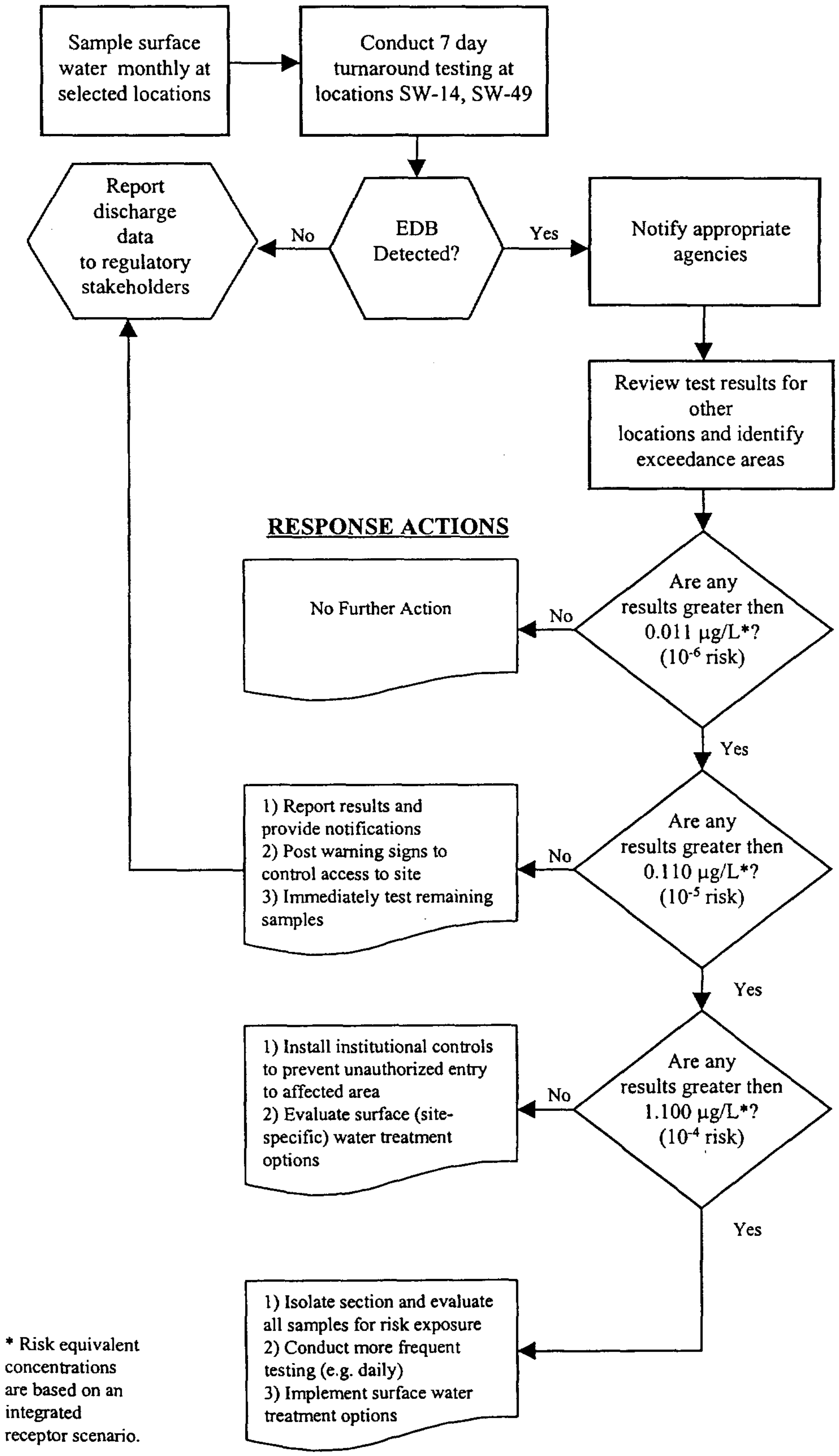
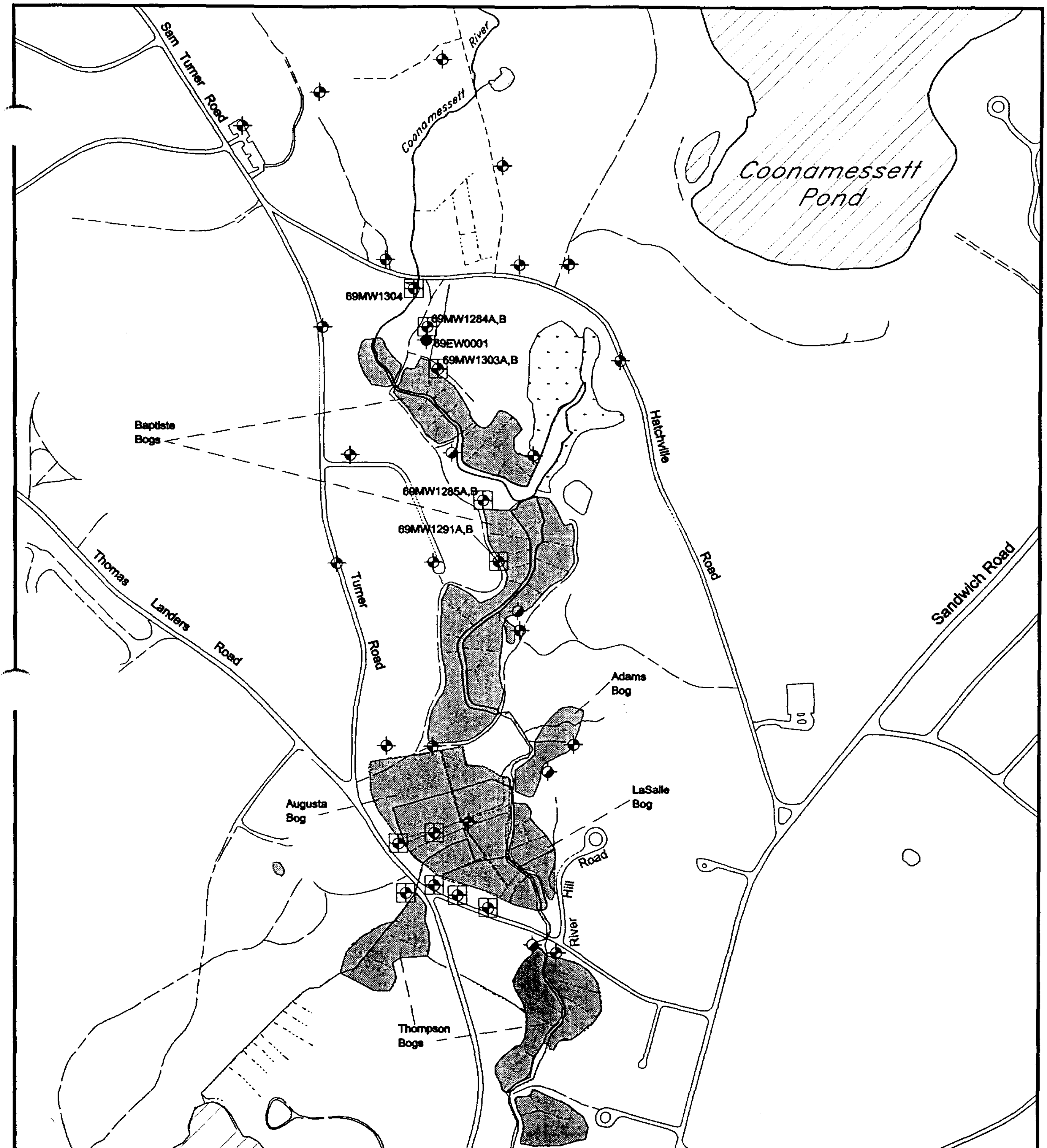


Figure 7-0
Surface Water
Decision Tree
FS-28



Legend

Monitoring Well

Existing Irrigation Wells

Monitoring Well Sampled Quaterly for EDB

N

0 250 500

Scale in Feet

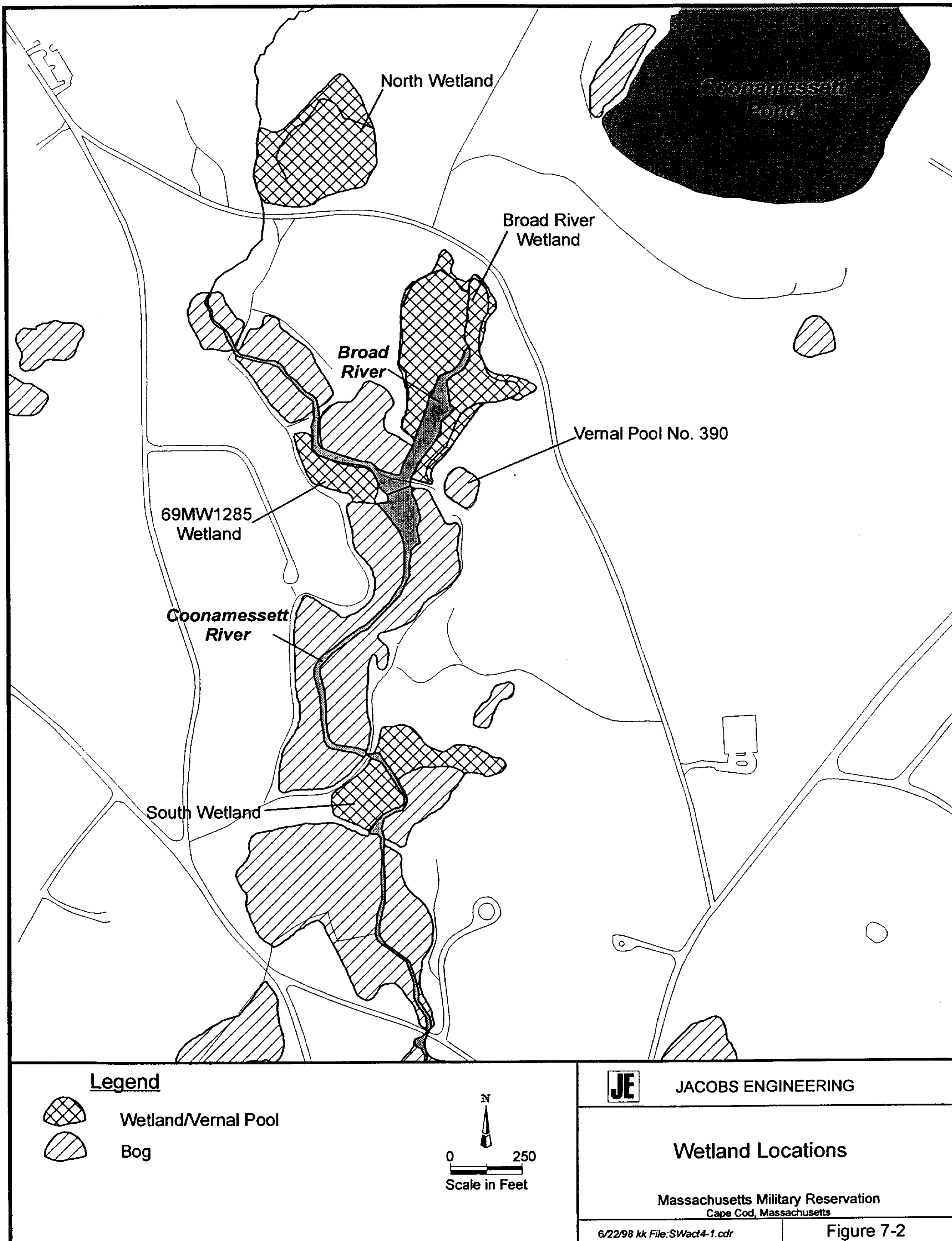
JE JACOBS ENGINEERING

Quarterly Performance Monitoring Locations

Massachusetts Military Reservation
Cape Cod, Massachusetts

10/15/98 mm...gwmw.DWG

Figure 7-1



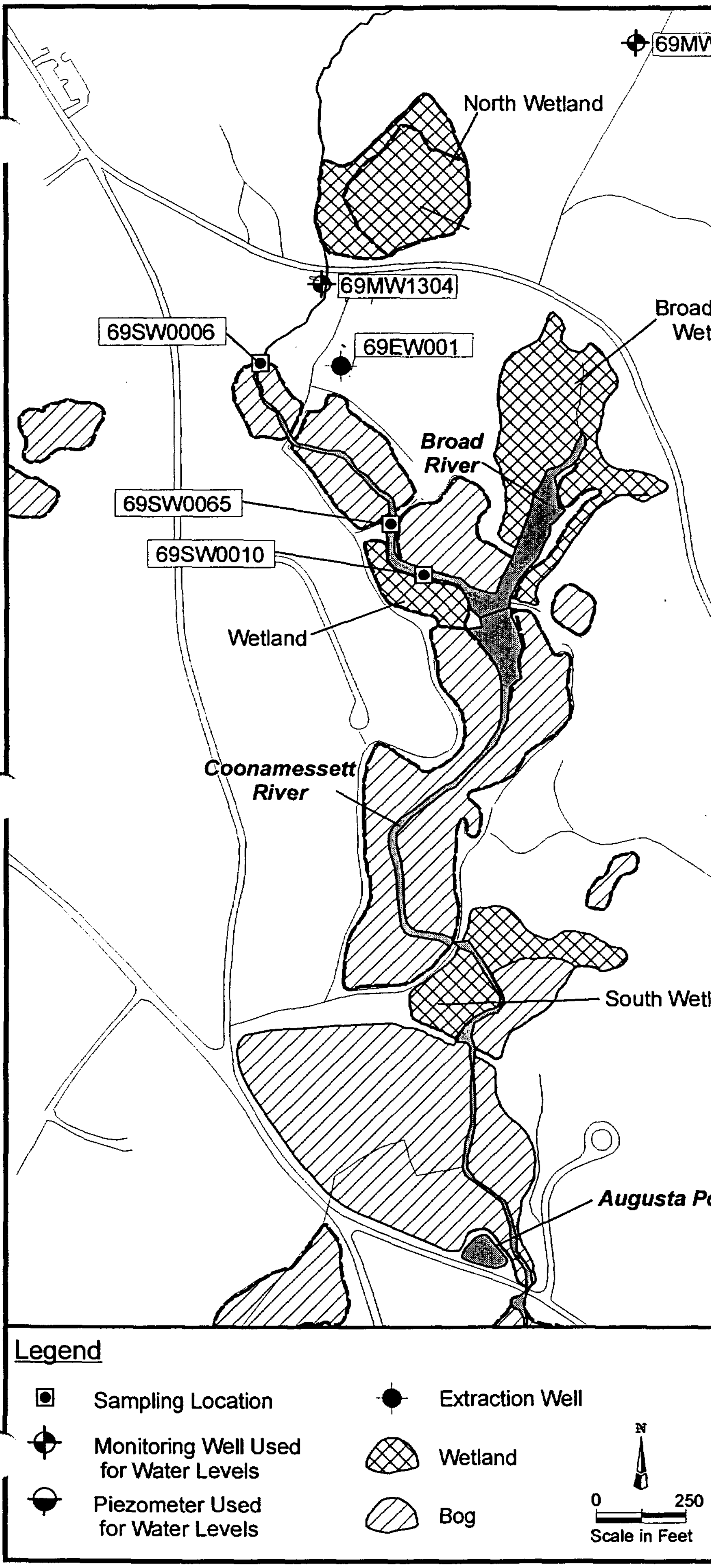
JE JACOBS ENGINEERING

Wetland Locations

Massachusetts Military Reservation
Cape Cod, Massachusetts

6/22/98 kk File:SWact4-1.cdr

Figure 7-2



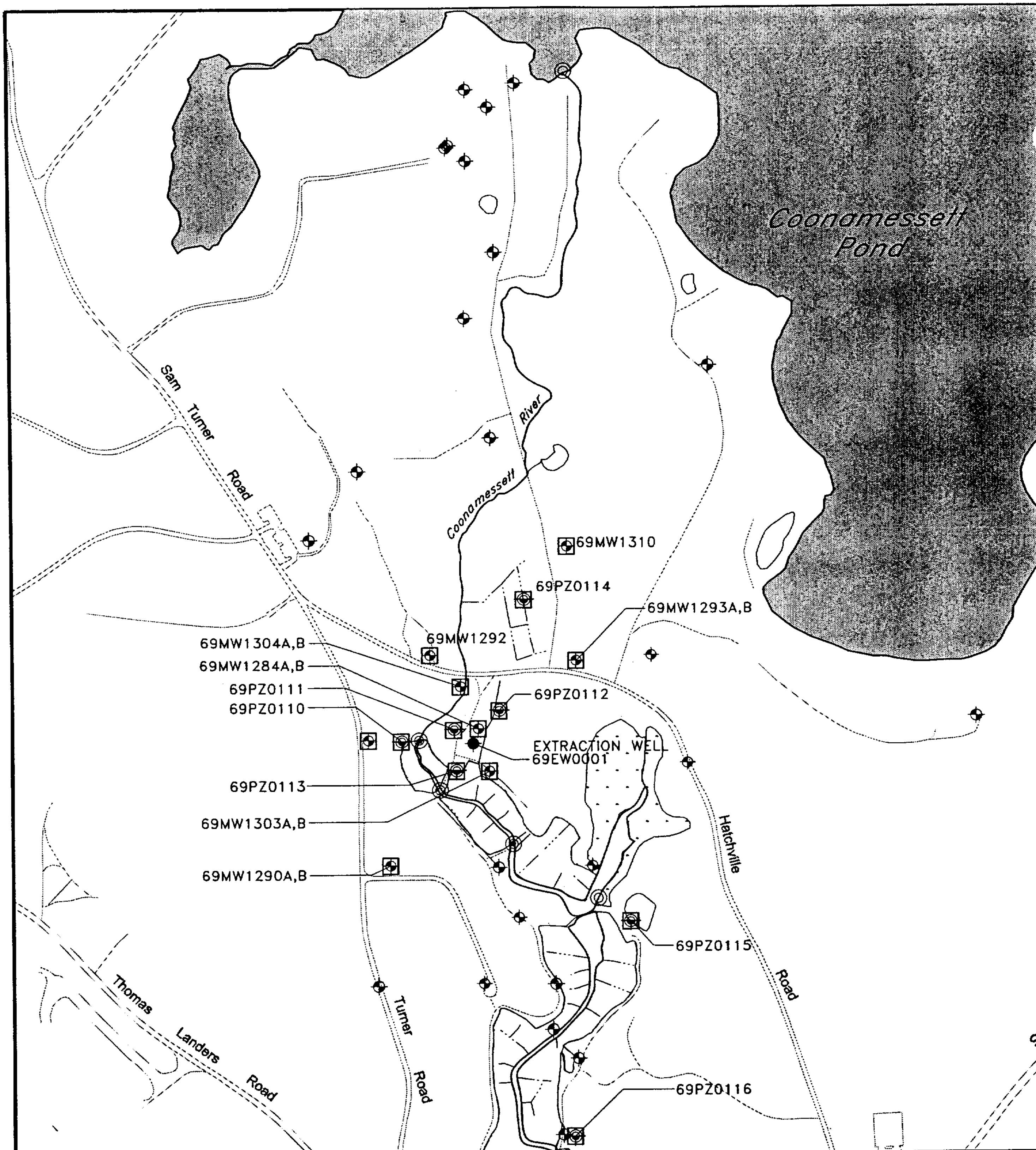
JACOBS ENGINEERING

Ecological Impact Sampling Locations

Massachusetts Military Reservation
Cape Cod, Massachusetts

3/2/98 mm File:SWact4-2.cdr

Figure 7-3



Legend

- Monitoring Well
- Piezometer
- Extraction Well (Not Monitored)
- Location where water levels collected

N

0 275 550

Scale in Feet

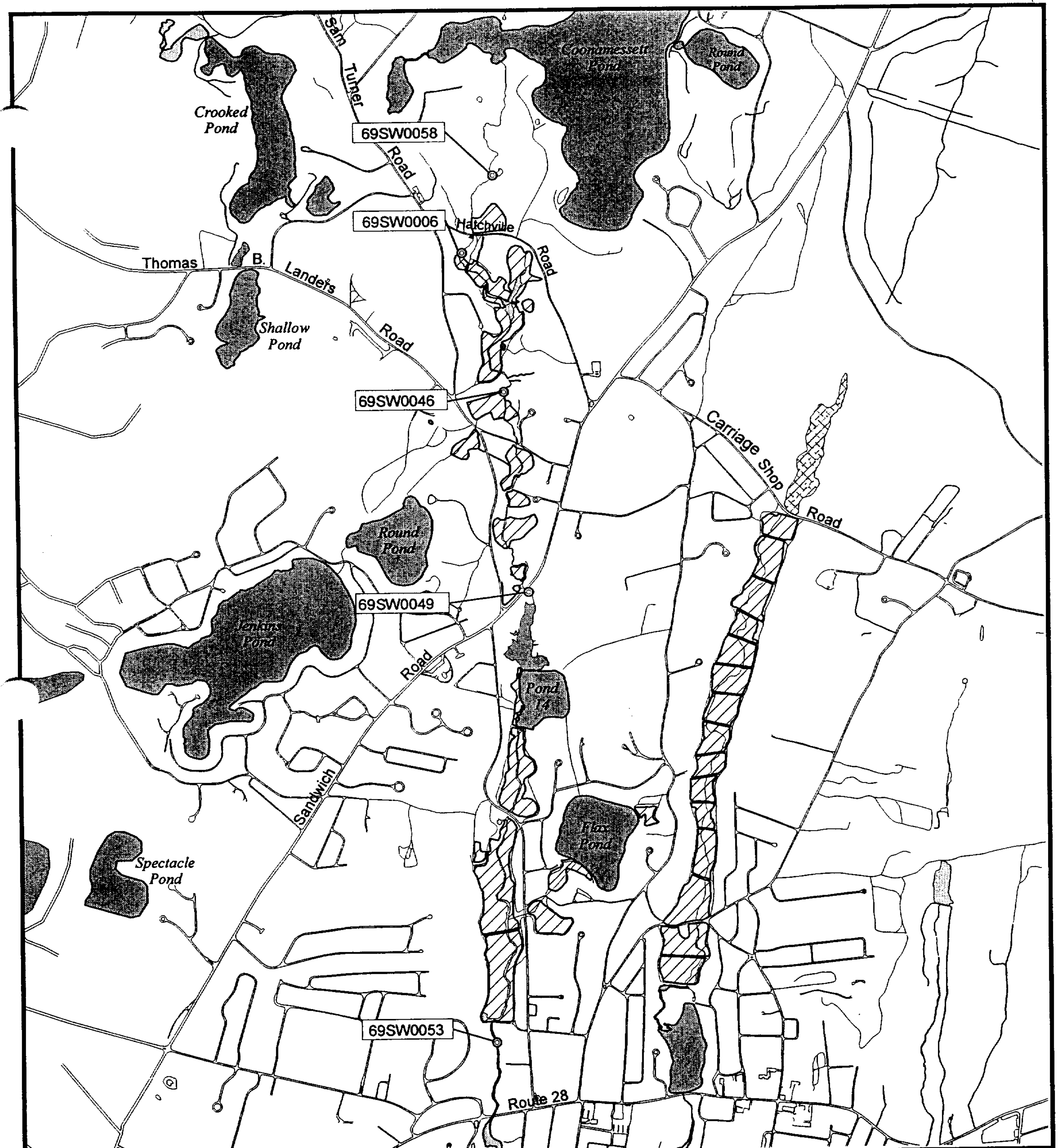
JE JACOBS ENGINEERING

Groundwater Level Monitoring Locations

Massachusetts Military Reservation
Cape Cod, Massachusetts

6/22/98 mm...PTOW.DWG

Figure 7-4



Legend

Surface Water Discharge Location

Bogs

N

0 2000

Scale in Feet

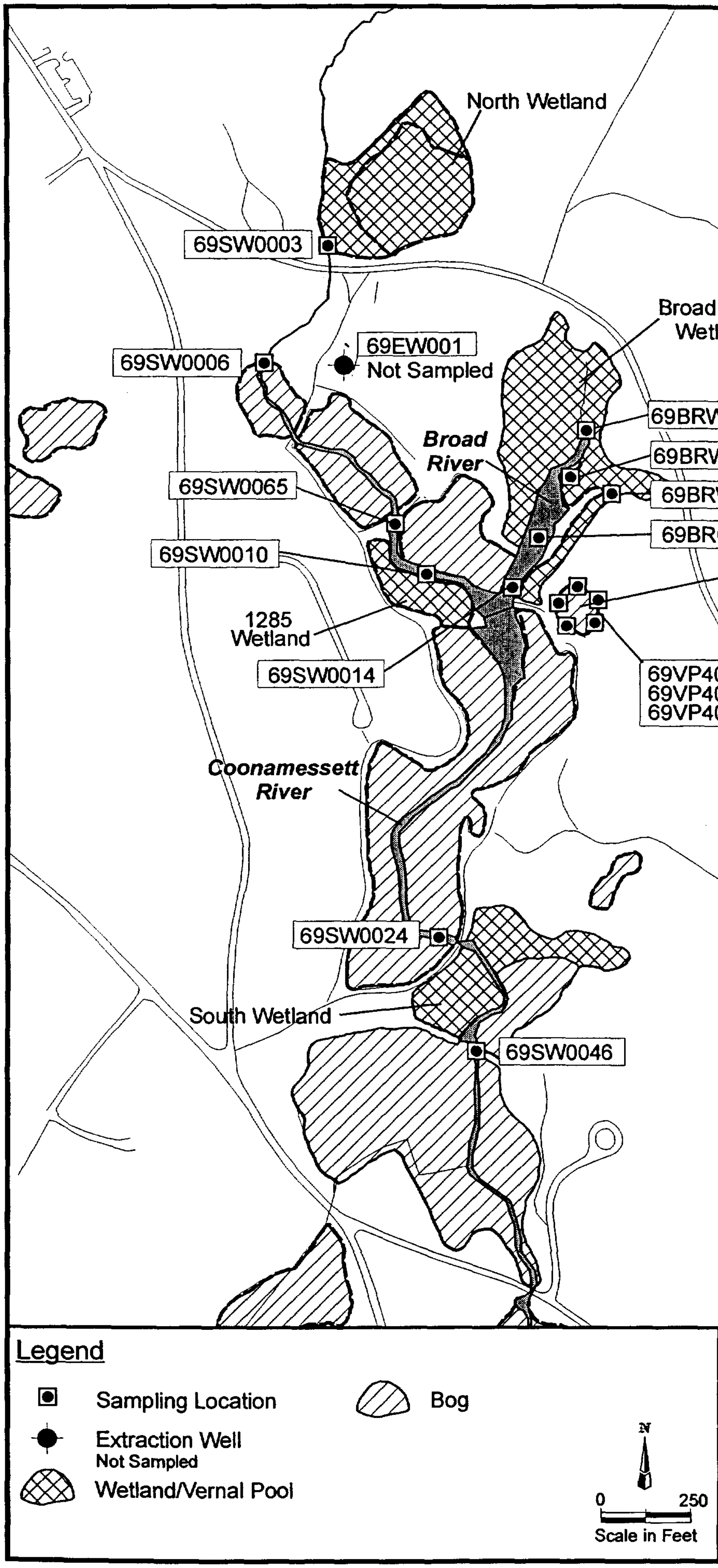
JE JACOBS ENGINEERING

Coonamessett River
Surface Water
Discharge Locations

Massachusetts Military Reservation
Cape Cod, Massachusetts

3/2/98 KK File:SW98_2-3.cdr

Figure 7-5



JACOBS ENGINEERING

Ecological Source Water and Sediment Sampling Locations

Massachusetts Military Reservation
Cape Cod, Massachusetts

6/22/98 mm File:SW98_4-5.cdr

Figure 7-6

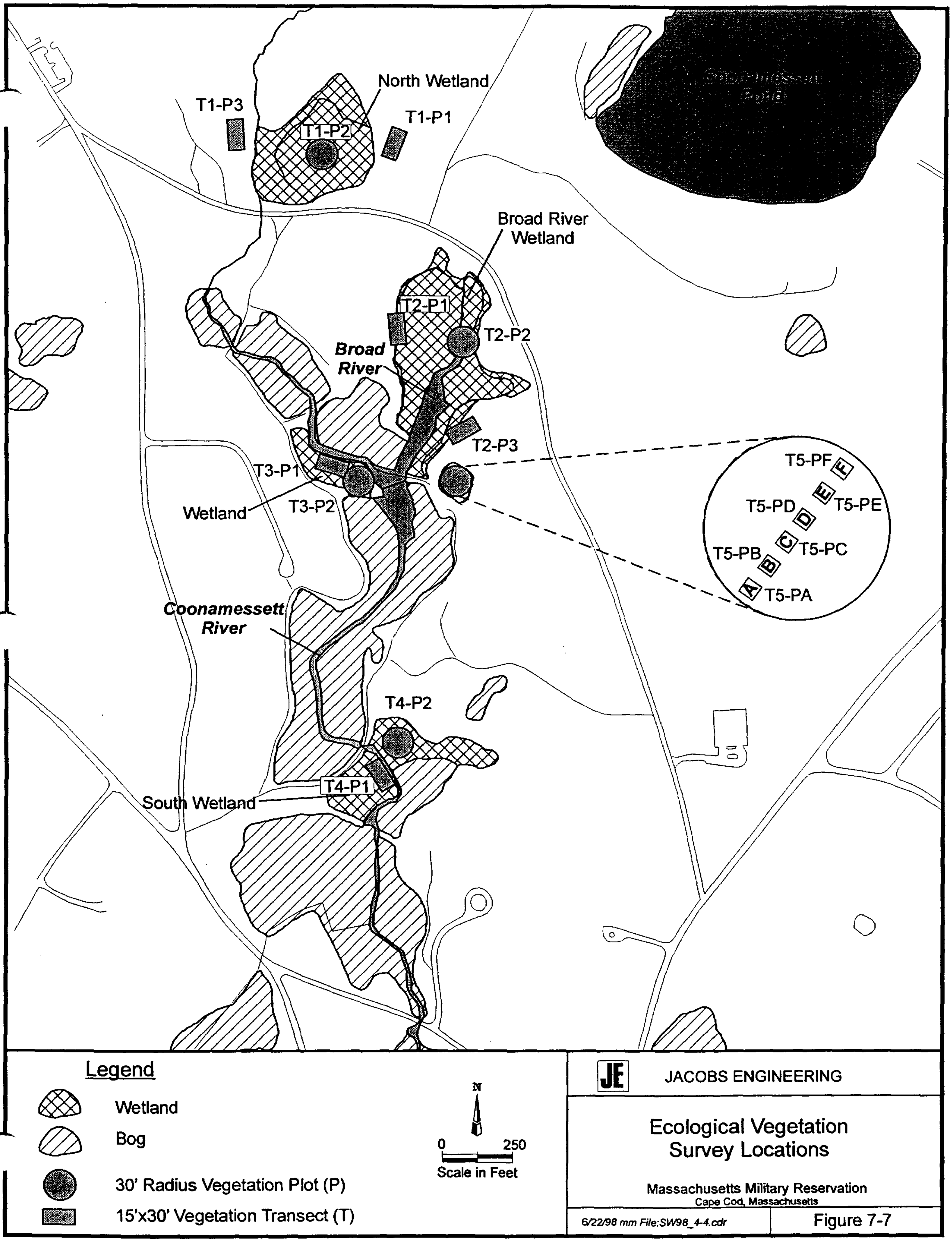
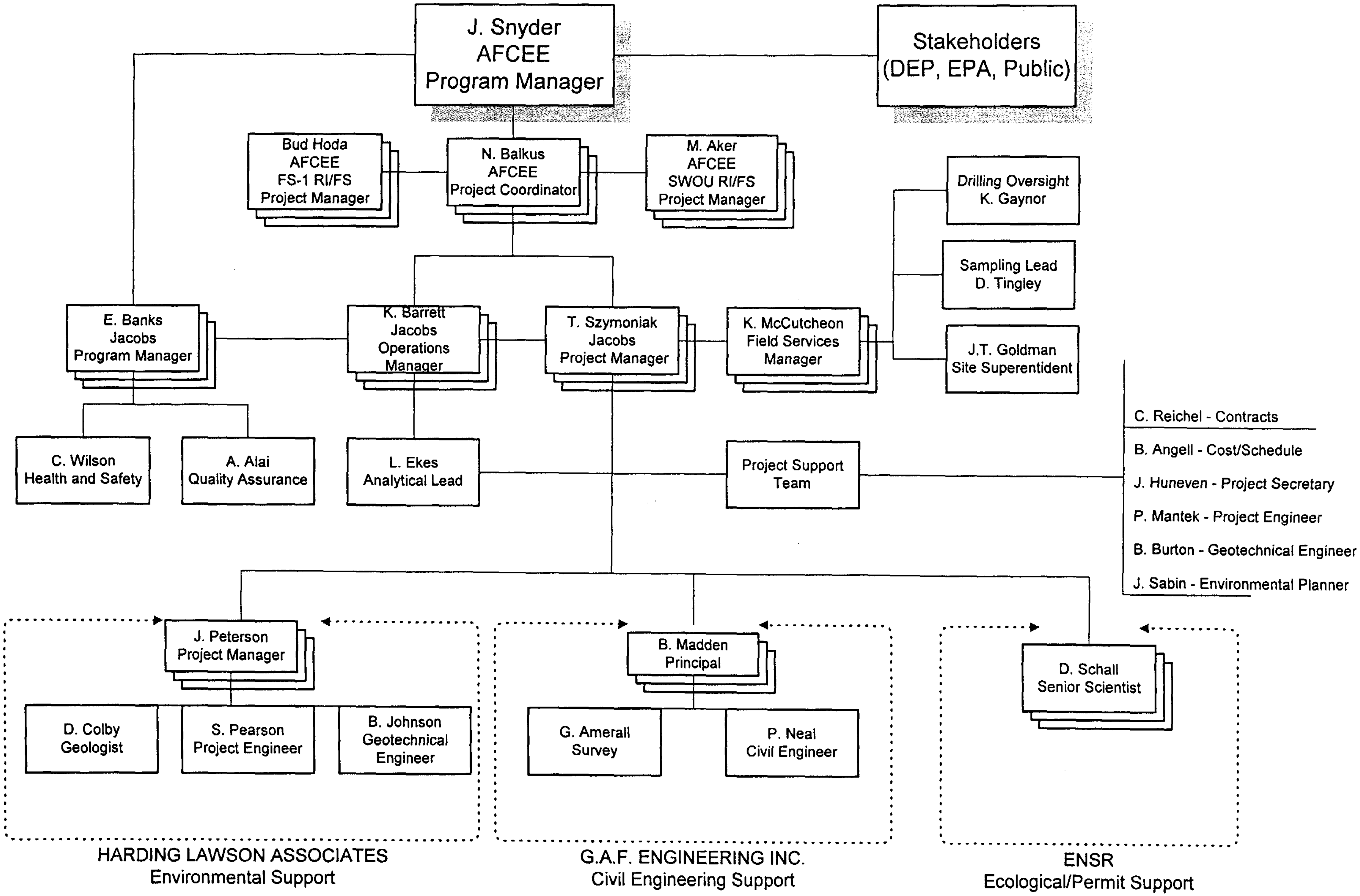

North Wetland
T1-P3
T1-P2
T1-P1
Broad River
Wetland
T2-P1
T2-P2
Broad
River
T2-P3
T3-P1
Wetland
T3-P2
T5-PF
T5-PD
T5-PE
T5-PB
T5-PC
T5-PA
A
B
C
D
E
F
Coonamessett
River
T4-P2
T4-P1
South Wetland
Legend
Wetland
Bog
30' Radius Vegetation Plot (P)
15'x30' Vegetation Transect (T)
N
0
250
Scale in Feet
JE
JACOBS ENGINEERING
Ecological Vegetation
Survey Locations
Massachusetts Military Reservation
Cape Cod, Massachusetts
6/22/98 mm File:SW98_4-4.cdr
Figure 7-7

Figure 8-1
Organization Chart
Bog Separation Project
October 21, 1998



TABLES

Table 1-1
Potentially Affected Bogs on the Coonamessett River

Index	Parcel Description	Owner	Estimated Acreage (acres)	Bog Active as of Oct., 1996[1]	Potentially Affected by EDB	Isolated from River	Method of Harvesting
E1	Upper Baptiste	Town of Falmouth	0.5	Yes	No	No	Dry
E2	Upper Baptiste	Town of Falmouth	1.5	Yes	No	No	Dry
E3	Upper Baptiste	Town of Falmouth	1.5	Yes	Yes	No	Dry
E4	Lower Baptiste	Town of Falmouth	6.6	Yes	Yes	No	Dry
F	Adams	Adams	1.05	Yes	Yes	No	Dry
G1	Augusta	Augusta	4.8	Yes	Yes	Yes[3]	Wet
G2	Augusta	Augusta	1.8	Yes	Yes	Yes[3]	Wet
H	Lassalle	Lassalle	1.5	Yes[2]	Yes	Yes	Wet
I1	Thompson (West)	Town of Falmouth	1.91	Yes	Yes	Yes	Dry
I2	Thompson (East)	Town of Falmouth	3.13	Yes	Yes	No	Dry
J	Chaston	Chaston	1.5	Yes	Yes	Yes	Wet
A	Reservoir	Town of Falmouth	7.84	Yes	Yes	No	Wet
B1	Middle	Town of Falmouth	13	Yes	Yes	No	Wet
B2	Middle	Town of Falmouth	0.6	Yes	Yes	No	Wet
C	Lower	Town of Falmouth	10.6	Yes	Yes	No	Wet
D1	Flax	Town of Falmouth	2.4	Yes	Yes	No	
D2	Flax	Handy	3	Yes	No	Yes	Wet
TOTAL ACREAGE			60.98				

[1] Date EDB discovered in groundwater adjacent to the Coonamessett River.

[2] Active bog in terms of operation permitted, but not productive in terms of harvesting

[3] The bog is isolated, but there are water control structures that regulate flow into and out of the bog.

TABLE 1-2
Modeling Results for Different Pumping Scenarious

	December 1996 (Initial Conditions)	10 Month (Reference Conditions)	Scenarios																				
			A 1 yr	A 5 yr	A 10 yr	A 20 yr	A 40 yr	B1 1 yr	B1 5 yr	B1 10 yr	B1 20 yr	B1 40 yr	B2 5 yr	C 5 yr	D 5 yr	E 1 yr	E 5 yr	E 10 yr	E 20 yr	E2 1 yr	E2 5 yr	E2 10 yr	E2 20 yr
EDB in Model (kg)																							
Total EDB at End of Interval	7.0	6.2	4.7	1.6	0.5	0.1	0.0	4.2	1.3	0.5	0.1	0.0	1.4	1.4	1.2	4.2	1.3	0.5	0.1	4.2	1.3	0.5	0.1
Loss Relative to 10 months	-0.7	0.0	1.5	4.6	5.7	6.1	6.2	2.0	4.9	5.8	6.1	6.2	4.8	4.9	5.0	2.0	4.9	5.8	6.1	2.0	4.9	5.8	6.1
% Loss	-12 %	0 %	24 %	74 %	91 %	98 %	100 %	33 %	79 %	93 %	98 %	100 %	78 %	78 %	80 %	33 %	79 %	93 %	98 %	33 %	79 %	93 %	98 %
Cumulative EDB Losses (%)																							
Other Wells	n/a	0 %	1 %	3 %	3 %	4 %	4 %	1 %	3 %	3 %	4 %	4 %	3 %	3 %	3 %	1 %	3 %	3 %	4 %	1 %	3 %	3 %	4 %
EW Well(s)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	21 %	54 %	63 %	66 %	67 %	44 %	52 %	65 %	21 %	54 %	63 %	66 %	21 %	54 %	63 %	66 %
Well Points	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	9 %	11 %	12 %	0 %	7 %	8 %	9 %
Coonamessett R. (Baptiste Bogs)	n/a	10 %	23 %	71 %	88 %	94 %	96 %	11 %	22 %	26 %	28 %	29 %	31 %	23 %	12 %	11 %	14 %	15 %	16 %	11 %	15 %	18 %	19 %
Total Loss	n/a	10 %	24 %	74 %	91 %	98 %	100 %	33 %	79 %	93 %	98 %	100 %	78 %	78 %	80 %	33 %	79 %	93 %	98 %	33 %	79 %	93 %	98 %
Flux of EDB to Discharge Points (g/day)*																							
Other Wells	n/a	0.09	0.13	0.04	0.01	0.00	0.00	0.13	0.04	0.01	0.00	0.00	0.04	0.04	0.04	0.13	0.04	0.01	0.00	0.13	0.04	0.01	0.00
EW Well(s)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2.45	0.67	0.12	0.02	0.00	0.49	0.55	0.73	2.45	0.67	0.12	0.02	2.45	0.67	0.12	0.02
Well Points	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.10	0.04	0.01	0.05	0.07	0.03	0.01
Total Wells	n/a	0.09	0.13	0.04	0.01	0.00	0.00	2.58	0.71	0.14	0.02	0.00	0.52	0.59	0.77	2.60	0.81	0.19	0.03	2.60	0.78	0.17	0.03
Coonamessett R. (Baptiste Bogs)	n/a	3.56	3.98	1.12	0.24	0.04	0.00	1.83	0.20	0.07	0.01	0.00	0.42	0.35	0.12	1.78	0.10	0.03	0.00	1.78	0.13	0.04	0.01
Total Loss	n/a	3.65	4.12	1.15	0.25	0.04	0.00	4.41	0.91	0.21	0.04	0.00	0.95	0.94	0.89	4.37	0.91	0.22	0.04	4.37	0.92	0.22	0.04
EDB Concentration in Pumped Water (μg/L)*																							
Other Wells	n/a	n/a	0.060	0.017	0.006	0.001	0.000	0.060	0.017	0.006	0.001	0.000	0.017	0.017	0.017	0.060	0.017	0.006	0.001	0.060	0.017	0.006	0.001
EW Well(s)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.750	0.205	0.038	0.006	0.000	0.223	0.145	0.103	0.750	0.205	0.038	0.006	0.750	0.205	0.038	0.006
Well Points	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.009	0.004	0.001	n/a	0.008	0.004	0.001
EDB Concentration in the Coonamessett R.																							
Model-predicted flow exiting Baptiste bogs (cfs)*	7.2	7.2	7.2	7.2	7.2	7.2	7.2	6.3	6.3	6.3	6.3	6.3	6.6	6.1	5.1	2.6	2.6	2.6	2.6	3.3	3.3	3.3	3.3
Flow including return flow (cfs)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7.6	7.6	7.6	7.6	7.6	7.5	7.7	8.0	8.6	8.6	8.6	8.6	8.0	8.0	8.0	8.0
EDB Due to Combined Discharge Zones (μg/L)*	n/a	0.20	0.23	0.06	0.014	0.002	0.000	0.12	0.013	0.005	0.001	0.000	0.026	0.024	0.010	0.28[a]	0.016[a]	0.004[a]	0.001[a]	0.22	0.016	0.005	0.001
EDB with return flow (μg/L)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.10	0.011	0.004	0.001	0.000	0.023	0.019	0.006	0.08[a]	0.005[a]	0.001[a]	0.000[a]	0.09	0.007	0.002	0.000
EDB Due to Southern Discharge Zone (μg/L)*	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	0.000	0.000	0.000	n/c	n/c	n/c	n/c

Notes:

n/a = not applicable

n/c = not calculated

* Rates and concentrations at the end of each time interval. Flow rates in the river do not include return flow from the EW well(s) treatment plant(s).

[a] Concentrations tabulated for the northern discharge zone only (no EDB is discharged from the southern zone in Scenario E).

Table 3-1
ARARs, Criteria, and Guidance for FS-28 Removal Actions

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
CHEMICAL-SPECIFIC REQUIREMENTS			
Federal			
Federal AWQC and Water Quality Standards (33 USC 1251 et seq.; 40 CFR 131.36 and 125.61)	Relevant and Appropriate	Federal AWQC are health-based criteria developed for carcinogenic and noncarcinogenic compounds and water quality parameters. AWQC are set at levels protective of human health for two routes of exposure: (1) drinking water and consuming fish, and (2) only consuming fish. Remedial actions must consider the uses of the water and the circumstances of the release or threatened release; this determines whether AWQC are relevant and appropriate.	Sampling and treatment of surface water in the Broad and Coonamessett rivers will meet these standards. These standards will be met for discharge through compliance with NPDES standards for Alternatives C1, C2, and E.
SDWA - MCLs (40 CFR 141.61 - 141.63)	Relevant and Appropriate	MCLs have been promulgated for organic and inorganic contaminants. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered relevant and appropriate for groundwater aquifers used for drinking water.	The ETR system (Alternatives C1, C2, and E) will be designed to treat extracted groundwater to these standards. For the ETR system, MCLs are *relevant and appropriate.*
State			
Massachusetts Drinking Water Regulations (310 CMR 22.00)	Relevant and Appropriate	Massachusetts Drinking Water Standards are generally equivalent to federal MCLs. When state levels are more stringent than federal levels, the state levels must be attained. The state MCL for EDB is 0.02, which is more stringent than the federal MCL of 0.05.	The ETR system (Alternatives C1, C2, and E) will be designed to treat extracted groundwater to these standards.
Massachusetts Groundwater Quality Standards (314 CMR 6.00)	Applicable	These standards limit the concentration of certain materials allowed in classified Massachusetts waters. The groundwater beneath MMR has been classified as Class I water or fresh groundwater found in the saturated zone of unconsolidated deposits and is designated as a source of potable water.	These standards will be attained because the clean-up levels or potential discharge limits were set using these as guidelines.
Massachusetts Surface Water Quality Standards (314 CMR 4.00)	Relevant and Appropriate	These regulations limit or prohibit discharges of pollutants to surface waters to assure that surface water quality standards of the receiving waters are protected and maintained or attained. Discharges may be limited or prohibited to protect existing uses and not interfere with the attainment of designated uses in downstream and adjacent segments.	These standards will be used to set cleanup levels for surface water treatment in the Broad and Coonamessett rivers.

Table 3-1
ARARs, Criteria, and Guidance for FS-28 Removal Actions

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
LOCATION-SPECIFIC REQUIREMENTS			
WETLANDS			
Federal			
Protection of Wetlands - Executive Order 11990 (40 CFR 6, Appendix A)	Applicable	Appendix A of 40 CFR 6 sets forth policy for carrying out provisions of the Protection of Wetlands Executive Order. Under this order, federal agencies are required to minimize the degradation, loss, or destruction of wetlands, and to preserve the natural and beneficial values of wetlands. Appendix A requires that no remedial alternatives adversely affect a wetland if another practicable alternative is available. If no alternative is available, effects from implementing the chosen alternative must be mitigated.	Removal actions (i.e., extraction of water for irrigation) within a cranberry bog or other wetland will be done in a manner to minimize the impact. Altered areas will be repaired or restored.
State			
Massachusetts Wetlands Regulations (310 CMR 10.00)	Applicable	These regulations protect inland and coastal wetlands, as well as a 100-foot buffer zone, from activities that may alter the resource area. Some wetlands receive additional protection as wildlife habitat. Status of wildlife habitat is determined by the presence of particular plant communities or hydrologic characteristics. The regulations specifically prohibit the loss of over 5,000 square feet of bordering vegetated wetlands. The loss may be permitted with replication of the lost area within two growing seasons.	If FS-28 removal actions alter more than 5,000 square feet of protected area, the affected area will be restored within two growing seasons.
OTHER NATURAL RESOURCES			
Federal			
Endangered Species Act (16 USC 1531 et seq.) (50 CFR 17.11-17.12)	Applicable	This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modifying their habitat.	No federally classified endangered or threatened species were identified at MMR.
State			
Massachusetts Endangered Wildlife and Wild Plants (321 CMR 8.00)	Applicable	The Commonwealth of Massachusetts has authority to research, list, and protect any species deemed threatened. These species are listed as either endangered, threatened, or species of special concern in the regulations. The Massachusetts lists may differ from the federal lists of endangered species. Actions must be conducted in a manner that minimizes the effect on Massachusetts-listed endangered species and species listed by the Massachusetts Natural Heritage Program.	Three state-listed species (grasshopper sparrow, upland sandpiper, northern harrier) are known to inhabit the grassland areas of MMR. Any species in the site area listed by the state as endangered, threatened or of special concern will be identified during the design phase. Activities will be designed so as to not adversely affect listed species.

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Table 3-1
ARARs, Criteria, and Guidance for FS-28 Removal Actions

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
ACTION-SPECIFIC REQUIREMENTS			
Federal			
RCRA Identification and Listing of Hazardous Wastes; Toxicity Characteristics (40 CFR Part 261.24)	Relevant and Appropriate	These requirements identify the maximum concentrations of contaminants for which the waste would be a RCRA-characteristic hazardous waste for toxicity. The analytical test given in Appendix II is referred to as the TCLP.	Spent carbon sent offsite for disposal (not including regeneration) will be analyzed for TCLP. If TCLP results exceed the standards in 261.24, the material will be disposed of offsite in a RCRA-permitted TSD facility.
DOT Rules for Transportation of Hazardous Materials (49 CFR Parts 107, 171, 172)	Applicable	These regulations outline procedures for the packaging, labeling, manifesting, and transporting of hazardous materials.	Hazardous and contaminated materials will be packaged, manifested, and transported to a licensed off-site disposal facility in compliance with these regulations. Spent carbon that will be shipped offsite for regeneration would be characterized for the list of hazardous substances given in 49 CFR 172.101 Appendix A.
Rivers and Harbors Act of 1899 (33 USC 403; 33 CFR Parts 320-323)	Relevant and Appropriate	Section 10 of the Rivers and Harbors Act of 1899 requires authorization from the Secretary of the Army, acting through the Army Corps of Engineers, for the construction of any structure in or over any "navigable water of the U.S." It also requires such authorization for the excavation from or deposition of material in such waters, or any obstruction or alteration in such waters.	All actions within navigable waters will be coordinated with the Army Corps of Engineers.
National Pollutant Discharge Elimination System (NPDES) (40 CFR 122-125 and 131)	Applicable	Establishes discharge limitations, monitoring requirements and best management practices for any direct discharge from a point source into surface water.	Discharges of treated water (Alternatives C1, C2, and E) from surface water treatment or the ETR system into the Coonamessett River or cranberry bogs will meet these standards.
Fish and Wildlife Coordination Act (16 USC 661 *et seq.*)	Relevant and Appropriate	This act requires that any federal agency proposing to modify a body of water must consult with the U.S. Fish and Wildlife Service, National Marine Fisheries Services, and other related state agencies to develop measures to prevent, mitigate or compensate for project-related losses to fish and wildlife. Such action should be viewed in the context of obtaining maximum overall project benefits such as cleaning up the site. The requirements to comply with this Act are contained in EPA's NPDES permit regulations (40 CFR 122.49).	Actions will be taken to develop measures to prevent, mitigate or compensate for project-related impacts to fish and wildlife (All Alternatives). Relevant agencies will be contacted to help analyze the impact on fish and wildlife from installing treatment, and discharging treated water to the Coonamessett River or cranberry bog.
State			
Massachusetts Hazardous Waste Management Regulations Requirements for Generators of Hazardous Waste (310 CMR 30.300)	Relevant and Appropriate	This requirement sets standards for generators of hazardous waste that address (1) accumulating waste, (2) preparing hazardous waste for shipment, and (3) preparing the uniform hazardous waste manifest.	If RCRA-characteristic hazardous wastes are generated from the FS-28 treatment system or well installation and shipped offsite, the material must be shipped in proper containers that are accurately marked and labeled, and the transporter must display proper placards. All waste shipments must be accompanied by an appropriate manifest.

Table 3-1
ARARs, Criteria, and Guidance for FS-28 Removal Actions

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Massachusetts Hazardous Waste Management Regulations Location Standards for Facilities (310 CMR 30.700 - 30.707)	Relevant and Appropriate	Under these standards, a new facility may not be located in an area subject to flooding; within the watershed of a Class A or Class SA segment of the surface water body unless it is determined that there is no feasible alternative; on land overlying an actual, planned, or potential public or private drinking water source; or in the flow path of groundwater supplying water to an existing well. In addition, there shall be a minimum of 300 feet from the active portion of the facility to the facility property line.	Any treatment facilities will be located and operated to fulfill these regulations unless there is no feasible alternative. A waiver may be requested for the distance from the treatment facility to the property line.
Massachusetts Groundwater Discharge Permits (314 CMR 5.00)	Relevant and Appropriate	These regulations provide permit information, including conditions and variances.	Discharge of treated water to the ground or groundwater requires permit.
Massachusetts Surface Water Discharge Permits (314 CMR 3.00)	Relevant and Appropriate	These regulations include permit application procedures, permit reviews, variances, and permit conditions.	Discharge of treated water to a surface water body (i.e., Coonamessett River, the Broad River or cranberry bogs) requires permit.
Massachusetts Air Pollution Control Regulations (310 CMR 7.00)	Applicable	These regulations set emission limits necessary to attain ambient air quality standards.	Removal actions (e.g., well drilling and the installation of piping) will be conducted to meet the standards for visible emissions (310 CMR 7.06); dust, odor, construction, and demolition (310 CMR 7.09); noise (310 CMR 7.10); and volatile organic compounds (310 CMR 7.18). If standards are exceeded, emissions will be managed through engineering controls.

Notes:

ARAR = Applicable or Relevant and Appropriate Requirement
AWQC = Ambient Water Quality Criteria
CERCLA= Comprehensive Environmental Response Compensation and Liability Act
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
CSFs = cancer slope factors
CWSW = Coonamessett Water Supply Wells
EDB = ethylene dibromide
EPA = United States Environmental Protection Agency
ETR = extraction, treatment, reinjection
MCLs = Maximum Contaminant Levels
MGL = Massachusetts General Law
MMR = Massachusetts Military Reservation
NPDES = National Pollutant Discharge Elimination System
RCRA = Resource Conservation and Recovery Act
RfDs = Reference Doses
SDWA = Safe Drinking Water Act
TCLP = Toxicity Characteristic Leaching Procedure
TSD = treatment, storage, disposal
USC = United States Code

Table 3-2
Summary of Regulatory Criteria and Required Environmental Permits

Agency	Activity						
	Construction of Berms & Weirs	**Sheet Piles**	**Shallow Well GW Extraction[I]**	**Reintroduce Treated Water to Bogs**	**Reintroduce Treated Water to River**	**Constructing Holding Ponds within 200' buffer[II]**	**Construction of Pump Station within 200' buffer**
EPA	Exempt activity under 40 CFR Part 232.3 (c) "The following activities are exempt from section 404 permit requirements, …" (1) (I) Normal farming, silvaculture and ranching activities such as plowing, seeding, cultivating, minor drainage, and harvesting for the production of food, fiber .." (3) (I) "Minor drainage means:… (B) The discharge of dredged or fill material for the purpose of installing ditching or other water control facilities incidental to planting, cultivating, protecting, or harvesting of rice, cranberries or other wetland crop species, …"	Not regulated	Not a CERCLA action. See ACOE discussion	Reintroducing treated water for irrigation and harvesting purposes are considered to be a BMP by EPA. However, modification of MMR, NPDES permit will be needed.	Reintroducing treated water for irrigation and harvesting purposes are considered to be a BMP by EPA. However, modification of MMR, NPDES permit will be needed.	Upland activity. Not regulated.	Upland activity. Not regulated.
ACOE Section 404 Permit	If EPA finds activity to be exempt, ACOE will concur.	33 CFR PART 323.3 (C)(1)(2) 404 permits required for pilings that increase sedimentation rates or reduce the reach or impairs the flow or circulation of the river. "Placement of pilings for linear projects, such as bridges, elevated walkways, and powerline structures…" do not require a 404 permit. Not applicable	Less than 5,000 FT^2 impact: Category 2 Programmatic General Permit required because of water withdrawal.	Not regulated	Not regulated	Upland activity. Not regulated.	Upland activity. Not regulated.

Table 3-2
Summary of Regulatory Criteria and Required Environmental Permits

Agency	Activity						
	Construction of Berms & Weirs	**Sheet Piles**	**Shallow Well GW Extraction[i]**	**Reintroduce Treated Water to Bogs**	**Reintroduce Treated Water to River**	**Constructing Holding Ponds within 200' buffer[ii]**	**Construction of Pump Station within 200' buffer**
State DEP Wetlands Section	Regulated under 310 CMR 10.053 as limited status project	Regulated under 310 CMR 10.053 as limited status project	Regulated under 310 CMR 10.053 as limited status project	Regulated under 310 CMR 10.053 as limited status project	May require a Request for Determination of Applicability (RDA).	Regulated under 310 CMR 10.053 as limited status project	May require a Request for Determination of Applicability (RDA).
State DEP Division of Water Supply	Not applicable.	Not applicable	Water Withdrawal Permit Required under 310 CMR 19	Must meet 310 CMR 19 requirements	Must meet 310 CMR 19 requirements	Must meet 310 CMR 19 requirements	Not regulated
Conservation Commission Towns of Falmouth & Mashpee	Same as DEP	Same as DEP	Same as DEP	Same as DEP	May require a Request for Determination of Applicability (RDA).	Same as DEP	May require a Request for Determination of Applicability (RDA).

For Coonamessett project; extraction wells will be located in Lower Baptiste bog. Wells will be located in upland area for Quashnet project.
As regulated by the Massachusetts Rivers Protection Act
Farming in Wetland Resource Areas: A Guide to Agriculture and the Massachusetts Wetlands Protection Act – January 1994, published by DEP.

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[i] For Coonamessett project; extraction wells will be located in Lower Baptiste bog. Wells will be located in upland area for Quashnet project.
[ii] As regulated by the Massachusetts Rivers Protection Act

Table 4-1
Bog and Flood Elevations on Upper Coonamessett River

Index	Parcel Description	Owner	Estimated Acreage (acres)	Bog Elevation MSL, ft.	Bog Flood Elevation MSL, ft	Remarks
E3	Upper Baptiste	Town of Falmouth	1.5	25	27	Diked across the Coonamessett River, but presently exposed to Broad River
E4	Lower Baptiste	Town of Falmouth	6.6	24.8	27	Coonamessett River flows down the middle of the bog
F	Adams	Adams	1.05	22.8	25	Coonamessett River flows on the west side of the bog
G1	Augusta	Augusta	4.8	22.7	25	Separated
G2	Augusta	Augusta	1.8	22.3	25	Separated
H	Lassalle	Lassalle	1.5	22.5	25	Coonamessett River flows on the west side of the bog
I2	Thompson (East)	Town of Falmouth	3.13	20.5	23	Coonamessett River flows down the middle of the bog
J	Chaston	Chaston	1.5	19.5	22	Separated

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Table 5-1 Coonamessett River Bog Alternative Summary

ALTERNATIVE	DESCRIPTION	FEATURES	EFFECTIVENESS	IMPLEMENTABILITY	COST
Alternative A	Limited action with institutional controls as needed	➢ Remove all bogs except Flax Pond (D1 & D2) and Upper Baptiste (E1 & E2) from production ➢ Maintain bogs in usable condition ➢ Install controls to limit access to bogs, if necessary ➢ Consider long-term compensation of bog owners/operators for lost production ➢ Continue to operate EW-1 Well and Treatment System ➢ Continue sampling and monitoring	**Protectiveness**: ✓ Protective of public health and community ✓ Protective of workers during implementation ✓ Protective of the environment ✓ Complies with ARARs **Ability to Achieve Removal Objectives:** ✓ Does not reduce concentrations of EDB to 0.2 ppb or non-detect ✓ Will maintain current status until long term solution implemented under RI/FS ✓ No disruption to current use ✓ Maintains bogs and channel ✓ Limits food chain exposure	**Technical Feasibility**: ✓ No improvement to bogs ✓ Demonstrated performance of institutional controls ✓ Adaptable to environmental conditions ✓ Does not actively contribute to remedial performance ✓ Requires several years river is restored (2007) **Availability**: ✓ Equipment ✓ Personnel and services ✓ Surface water testing must continue to assess exposure pathways ✓ No off-site treatment or disposal needed ✓ Institutional controls may not be acceptable to the community if they require fencing. **Administrative Feasibility:** ✓ Permits required listed in Tables 3-1, and 3-2 ✓ Easements required ✓ No impact on adjoining property ✓ Able to impose institutional controls with landowner cooperation ✓ Must seek additional federal legislative authority if bog owners are to be compensated for lost production.	**Capital**: $4.8M Crop **O&M**: $ **Real Estate**: $370K easements **TOTAL**: $5.2M Completed by 2007
Alternative B	Channel Realignment and Passive Treatment of Groundwater	➢ Continues to operate EW-1 groundwater extraction and treatment system at 600 gpm. ➢ Realigns approximately 2100 feet of the river channel to a side channel of the current bogs. ➢ Separates river from contaminated surface waters, including the Broad River ➢ Installs barrier (lining) to prevent upwelling of groundwater into the new river channel ➢ Creates two detention basins for passive treatment of EDB ➢ Mitigates the loss of wetlands at a ratio of 2:1 ➢ Creates riparian zones and a buffer on the exterior side of the new river channel ➢ Passive treatment basins can be returned to cranberry production following successful remediation ➢ Monitors long-term performance by analyzing surface and groundwater samples.	**Protectiveness**: ✓ Protective of public health and community ✓ Protective of workers during implementation since contaminated surface water separated from active areas ✓ Relies on passive treatment to reduce the levels of contamination ✓ Disrupts the current stream channel and requires a liner be placed to reduce upwelling. May require several years for riparian habitat to establish in new course. ✓ Complies with ARARs since permits are being sought. **Ability to Achieve Removal Objectives:** ✓ Meets concentration reduction goal below Pond 14 ✓ No residual effect concerns ✓ Maintains control until long term solution implemented ✓ Separates flow to control contaminated groundwater upwelling in area ✓ Improves fish passage over current conditions ✓ Creates riparian zone	**Technical Feasibility**: ✓ Disrupts existing river channel ✓ Does not eliminate EDB in upper river system, above Pond 14 ✓ Relies on detailed understanding of groundwater movement for success ✓ Contributes to remedial performance ✓ Can be implemented in 1 year **Availability**: ✓ Equipment ✓ Personnel and services ✓ Surface water testing will be required to ensure performance standards obtained ✓ No off-site treatment or disposal needed **Administrative Feasibility:** ✓ Permits required listed in Tables 3-1, and 3-2 ✓ Construction easements required ✓ No impact on adjoining property ✓ Able to impose institutional controls with landowner cooperation	**Capital**: $2.1M **O&M**: $200K **Real Estate**: $370K easements **TOTAL**: $2.7M Completed by 2003
Alternative C1	Channel Realignment and Active Treatment (1800 gpm) of Groundwater	➢ Continues to operate EW-1 groundwater extraction and active treatment system, however, need to determine volume of water to be treated to meet objectives of full scale program ➢ Realigns approximately 2100 feet of the river channel to a side channel of the current bogs ➢ Separates river from other surface waters in Broad River Pond ➢ Installs barrier (lining) to prevent upwelling of groundwater into the new river channel ➢ Installs shallow wells and sumps to remove groundwater for granulated active carbon (GAC) treatment of EDB. ➢ Existing treatment plant used for EW-1 pilot program then expanded to accommodate new GAC modules ➢ Discharges treated water back to river at four locations	**Protectiveness**: ✓ Protective of public health and community ✓ Protective of workers during implementation ✓ Protective of the environment ✓ Complies with ARARs **Ability to Achieve Removal Objectives:** ✓ C1 obtains entire river to non-detect faster than any other alternative ✓ No residual effect concerns ✓ Flexible program; allows pumping and treating groundwater at various rates ✓ Creates riparian zone	**Technical Feasibility**: ✓ Large treatment volume for C1 will be expensive to operate and maintain ✓ Demonstrated performance of GAC ✓ Adaptable pumping rate ✓ Contributes to remedial performance ✓ Can be implemented in 1 year **Availability**: ✓ Equipment ✓ Personnel and services ✓ No lab testing needed ✓ No off-site treatment or disposal needed **Administrative Feasibility:**	**Capital**: $4.3M **O&M**: $2.7M **Real Estate**: $370K easements **TOTAL**: $7.3M Completed by 2001

		upstream of extraction point. ➢ Mitigates the loss of wetlands at a ratio of 2:1 ➢ Creates riparian zones and a buffer on the exterior side of the river channel ➢ Basins can be utilized as cranberry bogs following remediation ➢ Monitors long term performance by analyzing surface and groundwater samples.	✓ Maintains control until long term solution implemented	✓ Permits required listed in Tables 3-1, and 3-2 ✓ Construction easements required ✓ No impact on adjoining property ✓ Able to impose institutional controls with landowner cooperation	
Alternative C2	Active Treatment (400 gpm) of Groundwater, separate the upper bogs and actively treat upwelling groundwater with No Channel Realignment	➢ Continues to operate EW-1 groundwater extraction and active treatment system at 600-800 gpm ➢ Installs shallow wells and sumps to remove groundwater for granulated active carbon (GAC) treatment of EDB. ➢ Existing treatment plant used for EW-1 pilot program	**Protectiveness**: ✓ Protective of public health and community ✓ Protective of workers during implementation ✓ Protective of the environment ✓ Complies with ARARs **Ability to Achieve Removal Objectives:** ✓ Uses existing treatment plant, no expansion required ✓ Meets concentration reduction goal below Pond 14 ✓ No residual effect concerns ✓ Maintains control until long term solution implemented	**Technical Feasibility**: ✓ Surface water concentrations may range between MCL and ND ✓ No back up system if lose power at treatment plant ✓ Contributes to remedial performance ✓ Demonstrated performance of GAC ✓ Can be implemented in less than 3 months since most of the equipment is already in place. Requires power be established from Hunky Dory Farm Road for new pumping station. **Availability**: ✓ Equipment is available ✓ Personnel and services ✓ Surface water sampling is required to verify the performance. ✓ No off-site treatment or disposal needed **Administrative Feasibility:** ✓ Permits required listed in Tables 3-1, and 3-2 ✓ Construction easements required for the addition to the treatment plant. ✓ No impact on adjoining property ✓ Able to impose institutional controls with landowner cooperation	**Capital**: $1.2M **O&M**: $incl. EW-1 **Real Estate**: $370K easements **TOTAL**: $1.6M Completed by 2003
Alternative D	Separate and Isolate All Downstream Bogs	➢ Continues to operate EW-1 groundwater extraction and treatment system ➢ Realigns approximately 2100 feet of the river channel to a side channel of the current upper bogs ➢ Constructs berms on either side of the river on lower bogs to prevent EBD contamination of bogs ➢ Separates river from other surface waters in Broad River Pond ➢ Installs barrier (lining) in river channel to prevent upwelling of groundwater ➢ Creates two detention basins for passive treatment of EDB ➢ Provides clean source of water from passive treatment system for cranberry production, but requires water management practices during flooding ➢ Mitigates the loss of wetlands at a ratio of 2:1 ➢ Creates riparian zones and a buffer on the exterior side of the river channel ➢ Basins can be utilized as cranberry bogs following remediation ➢ Monitors long-term performance by analyzing surface and groundwater samples.	**Protectiveness**: ✓ Protective of public health and community ✓ Protective of workers during implementation ✓ Protective of the environment ✓ Complies with ARARs **Ability to Achieve Removal Objectives:** ✓ Meets concentration reduction goal below Pond 14 ✓ Separates flow to control contaminated groundwater upwelling in upper bogs ✓ Separates river with contaminated water from productive bogs ✓ Passive treatment basins provides clean source of water for cranberry production ✓ Improves fish passage over current conditions ✓ Creates riparian zone ✓ No residual effect concerns ✓ Maintains control until long term solution implemented	**Technical Feasibility**: ✓ Creates need for alternative sources of water during harvest and winter flooding ✓ Channeling river decreases available storage area (bogs) to serve as buffer for +100 year flood events ✓ Bogs may leak through the subsurface since there is not an impermeable boundary. A constant source of water will be required to supply the bogs. ✓ Berries probably not marketable due to EDB in river surface water nearby ✓ Contributes to remedial performance **Availability**: ✓ Equipment ✓ Personnel and services ✓ No off-site treatment or disposal needed **Administrative Feasibility:** ✓ Permits required listed in Tables 3-1, and 3-2 ✓ Construction easements required ✓ No impact on adjoining property ✓ Able to impose institutional controls with landowner cooperation	**Capital**: $1.1M **O&M**: $ **Real Estate**: $370K easements **TOTAL**: $1.5M Completed by 2000
Alternative E	Phased Approach: Alternative Source of Water Separate Bogs	➢ Provides a source of clean water for flooding the bogs using effluent from the existing treatment system. ➢ Remove two weirs from the Augusta bog to remove the river as a source for bog flooding. ➢ Design discharge pipeline to accommodate 800 to 1500 gpm. The line could also be plumbed to the existing irrigation wells to supplement flow if necessary. Bury discharge pipeline in the existing bog access roads. ➢ Construct a holding pond on the Augusta Bog to store treated water. Holding pond to be constructed if the existing treatment plant is not expanded. Excavated material is then used for the proposed berms.	**Protectiveness**: ✓ Protective of public health and community ✓ Protective of workers during implementation ✓ Protective of the environment ✓ Complies with ARARs **Ability to Achieve Removal Objectives:** ✓ Provides clean water to bogs already separated from river ✓ Meets concentration reduction goal below Pond 14. Cranberries marketable for Fall 99 in Augusta, Chaston and West	**Technical Feasibility**: ✓ Without new reservoir, may not be able to flood bogs fast enough in emergency weather situation if the treatment plant is not expanded. ✓ Requires cooperation among the bog growers to coordinate the treated water discharges for flooding ✓ Requires active bog area to be taken out of production for the earthen berms. Sheet piles constructed within the active bog area will reduce the area required. ✓ Water may leak when the bog is flooded for cranberry operations thus requiring a constant source of water to maintain the flood depth ✓ Need pilot test to adequately design the full scale system and gauge the effectiveness and costs	**Capital**: $2.3M **O&M**: $2.0 **Real Estate**: $370K easements **TOTAL**: $4.7M Completed

	from River	➢ Continues to operate EW-1 groundwater extraction and treatment system ➢ Continues surface water sampling program ➢ Provides either earthen berms or sheet piles to separate the active bog from the river system	Thompson bogs ✓ Encourages best management practices to conserve water ✓ Sampling and analysis routinely performed on treated water. ✓ Separates the river from the bog thus allowing water to be held by the bog grower during fertilizer or pesticide applications ✓ Conserves water and utilizes best management practices for flooding	✓ Need power and additional piping to treatment plant **Availability**: ✓ Equipment and personnel are available ✓ Personnel and services ✓ Surface water sampling and analysis required to verify the performance. ✓ No off-site treatment or disposal needed **Administrative Feasibility:** ✓ Permits required listed in Tables 3-1, and 3-2 ✓ Construction easements required ✓ No impact on adjoining property ✓ Able to impose institutional controls with landowner cooperation ✓ Temporarily lose 9.0 acres of cranberry bogs	by 2003
	Active Treatment of Shallow Groundwater	➢ Continues to operate EW-1 groundwater extraction and treatment system but reduces flow from 800 gpm to 400 gpm ➢ Installs pilot study shallow well points in Lower Baptiste Bog to capture upwelling of contaminated groundwater ➢ Treats collected groundwater with remaining 400 gpm capacity at EW-1 plant ➢ Extracts surface water from Broad River and treats with remaining capacity at EW-1 plant ➢ Combines pilot test well points and Broad River surface water extraction to achieve 10-fold decrease in EDB concentration ➢ If pilot test or combination do not achieve 10-fold decrease using 400 gpm, expand into a full scale well-point extraction and treatment system of 1,000 to 1,800 gpm including expansion of the EW-1 treatment plant ➢ Continue surface water sampling program	✓ May accelerate removal of EDB ✓ Removal of ponded water in Lower Baptiste bog will increase natural groundwater upwelling and thus improve collection for treatment ✓ No residual effect concerns ✓ Maintains control until long term solution implemented		

TABLE 6-1

Proposed Surface Water Separation Alternatives

Key Character-istics	Earthen Berm (Option #1)		Sheet Pile Wall (Option #2)	
	Advantages	**Disadvantages**	**Advantages**	**Disadvan-tages**
Impacts to the Environment	Re-use soil from excavation of storage reservoir.	Multiple trucks backing up near river with increased potential for rollover and spill.	Minimal to no sediment release potential during construction or operation. Construction on ice would result in virtually no impact	
Reduction in Productive Bog Area (2,000 ft length)		18 sq. ft per linear foot (36,000 sq. ft) Requires large radius turns for large dump trucks.	One sq. ft per linear foot (2,000 sq. ft) Able to follow contours of river to minimize separation from river	
Impact on remaining bog vegetation	Minimal, work all performed from atop the berm.		Construction on ice would result in virtually no impact.	Potential damage to young growth,
Additional Wetland Area (area between river and structure)	Large area due to inability to hug river edge (potentially 20,000 sq. ft).		Able to follow contours of river to minimize separation from river (potentially 5,000 sq. ft).	
Time to execute (two crews)	8-10 weeks	-	4-6 weeks	
Impacts to neighbor-hood		Multiple pieces of heavy equipment. Heavy truck traffic. Long construction time	Minimal heavy equipment. Mostly light passenger traffic.	Jackhammer noise.
Maintenance	Minimal with proper design. Moderately resistant to scouring of river.	Settlement due to self weigh. Minimal resistance to scouring. Sloughing due to rapid dewatering.	50-year warranty. PVC material is patchable. Highly resistant to scouring of river and ice.	
Complexity of Construction	Locally available soils.	Staged construction sequence. Multiple materials required. Strict QA/QC required. Amended soils.	Low, typical installation. Small low ground-pressure equipment with electric jackhammer and manually handled materials.	

Table 7-1
Risk Management Monitoring

MONITORING OBJECTIVE	ENVIRONMENTAL PARAMETERS MONITORED	MONITORING FREQUENCY	LOCATIONS MONITORED
Ensure that surface water bodies do not contain concentrations of EDB that would pose an unacceptable inhalation, ingestion, or dermal contact exposure risk.	Surface water: EDB	Monthly	Risk: 69SW0014, , 69SW0046, 69SW0049, (TAT: 21 days) Marketability: 69SW0006,69SW0011,69SW0008,69SW0024,69SW2013, 69SW2004,69SW2014,69SW2001,69SW2002,69SW0060, 69SW0054,69SW2003,69SW2005,69SW0047,69SW0048, 69SW2006,69SW2007,69SW2008,69SW2009,69SW0051, 69SW0052,69SW2010,69SW2011,69SW2012, (TAT: 21 days)
Monitor the migration of the leading edge of the FS-28 plume.	Groundwater: EDB	Quarterly	Risk: 69MW1286, 69MW1300A,B 69MW1302, 69MW1306A,B, 69MW1308, 69MW1309. (TAT:20 days)
Evaluate the potential for the CWSW to become impacted by the EDB plume.	Groundwater: EDB	Monthly	Risk: raw water, 69MW1279A, 69MW1279B,& 69MW1279C (TAT 7 days)
Analyze water from private wells located near the plume for EDB until residents are connected to public water.	Residential well water: EDB	Residential water collected biweekly.	36 homes in Hatchville. (TAT:7 days)
Ensure that water used for spray irrigation does not contain detectable concentrations of EDB.	Irrigation wells: EDB (69IG0005 & 69IG0006 also sampled for VOCs)	All irrigation wells sampled annually.	All wells: 69IG0002, 9IG0003, 69IG0004, 69IG0005, 69IG0006, 69IG0007, 69IG0008, 69IG0009, 69IG0010, 69IG0011, & 69IG0013. (TAT 7 days)
Evaluate risk of inhalation of EDB	Air samples: EDB	As required, based on surface water concentrations of EDB.	Bogs where EDB has been detected at high concentrations.
Evaluate the potential for irrigation well usage to affect the plume migration.	Irrigation wells: EDB	Three wells closest to plume sampled following spray irrigation during spring and sampled biweekly during summer growing season.	Wells closest to plume: 69IG0002, 69IG0003, and 69IG0004 (TAT:7 days).
	Surface water in Augusta Bog: EDB	Surface water measured biweekly during growing season.	69SW0060,(TAT: 20 days)

CWSW	Coonamessett Water Supply Well	TAT	turnaround time
EDB	ethylene dibromide	VOCs	volatile organic compounds

Table 7-2
Surface Water Sampling Locations by Bog

Parcel Description	Owner	Acreage (acres)	Potential Affected Bog	Isolated from River	Method of Harvesting	Inflow Sample Location Identification	Outflow Sample Location Identification
Baptiste	Town of Falmouth	0.5	**No**	No	Dry	69SW0006*	69SW0011
Baptiste	Town of Falmouth	1.5	**No**	No	Dry	69SW0006*	69SW0011
Baptiste	Town Falmouth	1.5	Yes	**Yes**	Dry	69SW0008	69SW2000
Baptiste	Town of Falmouth	6.6	Yes	No	Dry	69SW0011	69SW0024*
Augusta	Augusta	6.5	Yes	**Yes**	Wet	69SW2001	69SW0060
Adams	Adams	1.05	Yes	No	Dry	69SW2004/13	69SW0014
Lassalle	Lassalle	1.50	Yes	**Yes**	Wet	69SW0046*	69SW2005
Thompson (West)	Town of Falmouth	1.91	Yes	**Yes**	Dry	69SW2002	69SW2003
Thompson (East)	Town of Falmouth	3.13	Yes	No	Dry	69SW0047*	69SW0048
Chaston	Chaston	1.50	Yes	**Yes**	Wet	69SW2006	69SW2007
Reservoir	Town of Falmouth	7.84	Yes	No	Wet	69SW2008	69SW0051
Middle	Town of Falmouth	13.68	Yes	No	Wet	69SW0051	69SW0052
Lower	Town of Falmouth	10.60	Yes	No	Wet	69SW0052	69SW2009
Flax Pond	Town of Falmouth	2.4	Yes	No		69SW2010	69SW2011
Flax	Handy	3.0	**No**	Yes	Wet	69SW2011	69SW2012

* Sampled as part of risk monitoring.

Table 7-3
Removal Action Performance Monitoring - FS-28

MONITORING OBJECTIVE	ENVIRONMENTAL PARAMETERS MONITORED	MONITORING FREQUENCY	LOCATIONS MONITORED
Evaluate effects of extraction on downgradient EDB concentrations.	Groundwater: EDB	once prior to start-up, then monthly for first 3 months, and quarterly thereafter	69MW1284A&B, 69MW1303A&B, 691291A&B69MW1285A&B, and 69MW1304 (TAT: 21 days)
Evaluate the efficiency of the granular activated carbon to remove ethylene dibromide and the need for other treatment.	Common anions, alkalinity, TDS, total TAL metals, BOD, COD, TSS, NO_3, NO_2	once at start-up (or first month following change-out), quarterly thereafter	GAC influent and effluent (TAT: 21 days)
	EDB, VOCs, DOC, & TOC	once at start-up (or first month following change out), monthly thereafter	GAC effluent (TAT: 7 days for EDB, others: 20 days)
	EDB	twice per day for first 3 days, daily for 2 weeks, 3 times per week for 2 weeks, biweekly through end of evaluation period, & monthly thereafter. Weekly following change-out for one month, monthly thereafter	intermediate sampling port (between lead and lag GAC vessels) (TAT: 24-hrs for weeks, 7-days for monthly)
	EDB	twice per day for first 3 days, biweekly through end of evaluation period, and monthly thereafter	GAC influent (TAT: 21 days)
Evaluate the rate of carbon conditioning and monitor parameters critical to river water quality.	pH and DO	four times per day during first 3 days, daily or more frequently through end of evaluation period, and quarterly or more frequently thereafter	GAC influent, effluent, intermediate sampling port, diffuser at discharge location, and in river downstream of discharge location.

BOD	biological oxygen demand	EDB	ethylene dibromide	TAL	target analyte list	TSS	total suspended solids
COD	chemical oxygen demand	GAC	granular-activated carbon	TAT	turnaround time	VOCs	volatile organic compounds
DO	dissolved oxygen	NO_2	nitrite	TDS	total dissolved solids		
DOC	dissolved organic carbon	NO_3	nitrate	TOC	total organic carbon		

Table 7-4
Chemical and Physicochemical Parameters
FS-28 Ecological Monitoring

Sample Matrix		Parameter	Method	Reference	Perservative	Sample Container	Holding Time	Validation Level
Surface Water/ Groundwater	Chemical	Target Compound List (TCL) Volatile Organic Compounds (VOCs)	Purge and Trap GC-MS	OLC02.1	No headspace; HCl to pH<2; Cool to 4° C	3 x 40 mL VOA vials	14 days	Summary and full data packages
		Ethylene Dibromide (EDB)	GC-ECD	E504.1	No headspace; Cool to 4° C; 0.008% $Na_2S_2O_3$ if residual chlorine is present	3 x 40 mL VOA vials	14 days; Analysis w/in 24 hours of extraction	Summary and full data packages
		*Target Analyte List (TAL) Metals (including Si and B) (total and dissolved) for freshwater samples	GFAA/ICP/CVAA	ILM04.0	HNO_3 to pH<2	1 L Plastic	180 days (Hg 28 days)	Summary and full data packages
		Target Analyte List (TAL) Metals (total and dissolved) for freshwater samples	GFAA/ICP/CVAA	ILM04.0	HNO_3 to pH<2	1 L Plastic	180 days (Hg 28 days)	Summary and full data packages
	Physicochemical	*Anions (Br, Cl, NO_3,NO_2, PO_4, SO_4)	IC	E300	Avoid exposure to sunlight; Cool to 4° C	1 L Plastic	28 days for Br, Cl, and SO_4; 48 hrs for NO_3, NO_2, and o-PO_4	Summary and full data packages
		**Anions (Br, Cl, NO_3,NO_2, PO_4, SO_4)	IC	E300	Avoid exposure to sunlight; Cool to 4° C; H_2SO_4 to pH<2	1 L Plastic	28 days for Br, Cl, and SO_4; 48 hrs for NO_3, NO_2, and o-PO_4	Summary and full data packages
		Nutrients (NO_3, NO_2, PO_4, NH_3) for freshwater, estuarine, and marine samples	Colorimetric	Strickland and Parsons or DOE	Avoid exposure to sunlight; Cool to 4° C	500 mL Plastic	48 hrs	Summary and full data packages
		*Ammonia (NH_3) for freshwater samples	Nessler	E350.2	H_2SO_4 to pH<2; Cool to 4° C	1 L Plastic	28 days	Summary and full data packages
		Total Kjeldahl Nitrogen (TKN)	Digestion	E351.1	H_2SO_4 to pH<2; Cool to 4° C	1 L Plastic	28 days	Summary and full data packages
		Total Phosphorus	Oxidation	E365.2	H_2SO_4 to pH<2; Cool to 4° C	1 L Plastic	28 days	Summary and full data packages
		Total Organic Carbon (TOC) and Dissolved Organic Carbon (DOC)	Oxidation	E415.1	Avoid exposure to sunlight; HCl to pH<2; Cool to 4° C	125 mL Amber	28 days	Summary and full data packages
		Dissolved Inorganic Carbon (DIC)	IR	E415.1 (modified)	No headspace, Cool to 4° C	4 x 40 mL VOA vials	7 days	Summary and full data packages
		COD	Oxidation	E410.1	H_2SO_4 to pH<2; Cool to 4° C	1 L Plastic	28 days	Summary and full data packages
		BOD	Incubation	E405.1	No headspace, Cool to 4° C	1 L Plastic	48 hrs	Summary and full data packages
		Alkalinity	Titrimetric	E310.1	Cool to 4° C	1 L Plastic	14 days	Summary data package
		Hardness	Tritrimetric	E130.2	HNO_3 to pH<2	1 L Plastic	28 days	Summary and full data packages
		Total Suspended Solids (TSS)/ Total Dissolved Solids (TDS)	Gravimetric	E160.1/160.2	Cool to 4° C	1 L Plastic	7 days	Summary data package
		Dissolved Oxygen (DO) (field)	Clarke Electrode	E360.2	NA	NA	NA	Field measurement
		Temperature (field)	Thermometric	E170.1	NA	NA	NA	Field measurement
		pH (field)	Potentiometric	E150.1	NA	NA	NA	Field measurement
		Turbidity (field)	Nephelometer	E180.1 (modified)	NA	NA	NA	Field measurement
		Specific Conductance (field)	Electrometric	E120.1	NA	NA	NA	Field measurement
Sediment	Chemical	*TCL VOCs	Purge and Trap GC-MS	OLM03.1 (Low)	No headspace; Cool to 4° C	4 oz Glass	14 days	Summary and full data packages
		TCL VOCs	Purge and Trap GC-MS	OLM03.1 (Low) modified for high % moisture content	No headspace; Cool to 4° C	4 oz Glass	14 days	Summary and full data packages
		*EDB	GC-ECD	E504.1 (Modified)	No headspace; Cool to 4° C	4 oz Glass	14 days; Analysis within 24 hours of extraction	Summary and full data packages
		EDB	GC-ECD	E504.1 (Modified) modified for high % moisture content	No headspace; Cool to 4° C	4 oz Glass	14 days; Analysis within 24 hours of extraction	Summary and full data packages
		*TAL Metals (total) (including Si and B)for freshwater samples	GFAA/ICP/CVAA	ILM04.0	Cool to 4° C	8 oz Glass	180 days (Hg 28 days)	Summary and full data packages
		TAL Metals (total) for freshwater samples	GFAA/ICP/CVAA	ILM04.0 modified for high % moisture content	Cool to 4° C	8 oz Glass	180 days (Hg 28 days)	Summary and full data packages
	Physicochemical	TOC	Combustion/Oxidation	Lloyd Kahn	Cool to 4° C	4 oz Glass	28 days	Summary data package
		Grain Size	Mechanical Sieving	ASTM D422	NA	8 oz Glass	NA	Summary data package

GC/MS = Gas chromatography/mass spectrometry
GC/ECD = Gas chromatography/electron capture detector
GFAA = Graphite furnace atomic adsorption
CVAA = Cold vapor atomic adsorption
H_2SO_4 = Sulfric acid

HNO_3 = Nitric acid
NA = Not applicable
HCL = Hydrochloric acid
IC = Ion chromatography

ICP/MS = Inductiviely coupled plasma/mass spectrometry
ICP = Inductively coupled plasma
* used for samples collected 1997
**used for samples collected in July 1997

Table 7-5
FS-28 Water Level Monitoring Locations

Location Identifier	Well Type	Rationale for Location
69MW1284A	Monitoring well	Monitor Upgradient Water Levels 55' N of Extraction Well
69MW1284B	Monitoring well	Monitor Upgradient Water Levels 55' N of Extraction Well
69MW1290A	Monitoring well	Monitor Downgradient Water Levels 610' SW of Extraction Well
69MW1290B	Monitoring well	Monitor Downgradient Water Levels 610' SW of Extraction Well
69MW1292	Monitoring well	Monitor Upgradient Water Levels 400' NW of Extraction Well
69MW1293A	Monitoring well	Monitor Upgradient Water Levels 528' NE of Extraction Well
69MW1293B	Monitoring well	Monitor Upgradient Water Levels 528' NE of Extraction Well
69MW1303A	Monitoring well	Monitor Downgradient Water Levels 145' SSE of Extraction Well
69MW1303B	Monitoring well	Monitor Downgradient Water Levels 145' SSE of Extraction Well
69MW1304A	Monitoring well	Monitor Upgradient Water Levels 236' NNW of Extraction Well
69MW1304B	Monitoring well	Monitor Upgradient Water Levels 236' NNW of Extraction Well
69MW1310	Monitoring well	Monitor Upgradient Water Levels 846' NNE of Extraction Well
69PZ0110	Piezometer	Monitor Upgradient Water Levels 350' W of Extraction Well
69PZ0111	Piezometer	Monitor Upgradient Water Levels 96' NW of Extraction Well
69PZ0112	Piezometer	Monitor Upgradient Water Levels 162' NNE of Extraction Well
69PZ0113	Piezometer	Monitor Downgradient Water Levels 139' SW of Extraction Well
69PZ0114	Piezometer	Monitor Water Levels in North Wetland
69PZ0115	Piezometer	Monitor Water Levels in Vernal Pool #390
69PZ0116	Piezometer	Monitor Water Levels in South Wetland

Table 7-6
Surface Water and Sediment Sample Locations and Proposed Measurements for FS-28

Habitat	Sample Location	Rationale for Selecting Sample Location	Surface Water			Sediment		
			Number of Samples	Parameters	Frequency	Number of Samples	Parameters	Frequency
Coonamessett River	69SW0003	Sample outflow of North Wetland to Coonamessett River	1 1	Chemical analysis Physicochemical analysis	Annually 6 times/yr	1 1	Chemical analysis Physicochemical analysis	Two times Two times
	69SW0006	Sample Coonamessett River west of extraction well	1 1	Chemical analysis Physicochemical analysis	Annually 6 times/yr	1 1	Chemical analysis Physicochemical analysis	Two times Two times
	69SW0010	Sample Coonamessett River downriver of treatment system outflow	1 1	Chemical analysis Physicochemical analysis	Quarterly 6 times/yr	1 1	Chemical analysis Physicochemical analysis	Two times Two times
	69SW0024	Sample downriver of the Coonamessett and Broad River junction	1 1	Chemical analysis Physicochemical analysis	Annually 6 times/yr	1 1	Chemical analysis Physicochemical analysis	Two times Two times
	69SW0046	Sample outflow of South Wetland to Coonamessett River	1 1	Chemical analysis Physicochemical analysis	Annually 6 times/yr	1 1	Chemical analysis Physicochemical analysis	Two times Two times
	69SW0065	Sample at treatment system discharge on Coonamessett River	1 1	Chemical analysis Physicochemical analysis	Quarterly 6 times/yr	1 1	Chemical analysis Physicochemical analysis	Two times Two times
Broad River	69BRW001	Sample Broad River within upper portion of Broad River Wetland	1 1	Chemical analysis Physicochemical analysis	Annually 6 times/yr	1 1	Chemical analysis Physicochemical analysis	Two times Two times
	69BRW002	Sample Broad River within upper portion of Broad River Wetland	1 1	Chemical analysis Physicochemical analysis	Annually 6 times/yr	1 1	Chemical analysis Physicochemical analysis	Two times Two times
	69BRW003	Sample Broad River within upper portion of Broad River Wetland	1 1	Chemical analysis Physicochemical analysis	Annually 6 times/yr	1 1	Chemical analysis Physicochemical analysis	Two times Two times
	69BRC001	Sample Broad River within middle of Broad River Wetland	1 1	Chemical analysis Physicochemical analysis	Annually 6 times/yr	1 1	Chemical analysis Physicochemical analysis	Two times Two times
	69SW0014	Sample junction of Broad River and Coonamessett River	1 1	Chemical analysis Physicochemical analysis	Annually 6 times/yr	1 1	Chemical analysis Physicochemical analysis	Two times Two times
Vernal Pool #390	69VP4001	Sample vernal pool	1 1	Chemical analysis Physicochemical analysis	Annually 6 times/yr	1 1	Chemical analysis Physicochemical analysis	Two times Two times
	69VP4002	Sample vernal pool	1 1	Chemical analysis Physicochemical analysis	Annually 6 times/yr	1 1	Chemical analysis Physicochemical analysis	Two times Two times
	69VP4003	Sample vernal pool	1 1	Chemical analysis Physicochemical analysis	Annually 6 times/yr	1 1	Chemical analysis Physicochemical analysis	Two times Two times

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APPENDIX A

MINUTES FROM STAKEHOLDER MEETINGS & RELATED MATERIALS

(1) 28 JANUARY 1998 AGENDA, MEETING MINUTES

(2) 3 MARCH 1998 AGENDA, MEETING MINUTES

(3) 8 APRIL 1998 MEETING MINUTES

(4) 28 JUNE 1998 MEETING MINUTES

(5) 9 SEPTEMBER 1998 AGENDA, MEETING MINUTES, PRESENTATION HANDOUT

(6) 16 SEPTEMBER 1998 MEETING MINUTES, PRESENTATION HANDOUT

(7) 21 SEPTEMBER 1998 MEETING MINUTES, PRESENTATION HANDOUT

(8) FALMOUTH CONSERVATION COMMISSION LETTER DATED 21 SEPTEMBER 1998

(9) HOUSE OF REPRESENTATIVES BILL 3579, EMERGENCY SUPPLEMENTAL APPROPRIATIONS ACT FOR FY98

(1)

28 JANUARY 1998 AGENDA, MEETING MINUTES

A WORKING MEETING
ON THE PRESENT AND FUTURE STATUS OF CRANBERRY BOGS
AT FS-1 AND FS-28
DRAFT AGENDA

WHEN

- Wednesday, 28 January 1998, 6:00 - 9:30 PM, Otis Golf Course Club House

GOAL

- To provide a working forum of invited participants to lay out the range of current and expected future issues related to cranberry bogs at FS-1 and FS-28 and to identify key next steps for proceeding.

DRAFT AGENDA

6:00 **Goals of Meeting, Groundrules, and Agenda Review**
CBI Facilitator

6:10 **What are the remedial actions and investigations currently taking place at FS-1 and FS-28?**
AFCEE Installation Restoration Program

6:30 **Questions and Comments**

6:40 **What are the public health concerns at FS-1 and FS-28?**
Massachusetts Department of Public Health

6:55 **Questions and Comments**

7:05 **What are the ecological concerns at FS-1 and FS-28?**
Massachusetts Department of Fisheries and Wildlife

7:20 **Questions and Comments**

7:30 **What are the criteria for a marketable crop from these bogs?**
Cape Cod Cranberry Growers

7:45 **<u>Questions and Comments</u>**

7:55 **What are the Town's concerns?**
Towns of Mashpee and Falmouth

8:15 **<u>Questions and Comments</u>**

8:25 **What are short (this year), mid (two to five years) and long (five plus years) options for proceeding?**
Brainstorming Session with All Participants

9:15 **Identify Next Steps**
All Participants

9:30 **Adjourn**

INVITED PARTICIPANTS

- AFCEE Installation Restoration Program
- Joint Program Office
- Environmental Protection Agency
- Executive Office of Environmental Affairs/Department of Environmental Protection
- Massachusetts Department of Public Health
- Agency for Toxic Substances and Disease Registry (ATSDR)
- Massachusetts Department of Fisheries and Wildlife
- Massachusetts Division of Marine Fisheries
- Cape Cod Cranberry Growers
- Ocean Spray Cranberries
- SMB Selectmen
- Mashpee & Falmouth Selectmen
- Mashpee and Falmouth Conservation Commissions
- Mashpee & Falmouth Boards of Health

DIRECTIONS

From the Falmouth gate, drive into MMR. At the blinking red light, take a left. Drive down this road, past Generals Boulevard and West Inner Road. As you approach another blinking light, you will see a sign for the golf course. Take a left on Gunther Road (before the blinking light) and drive about 2/10ths of a mile. The Club House, 28 Gunther Road, will be on your right. The phone numbers of the Club House are (508) 968-6453 and x6454.

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**Working Meeting on the
Present and Future Status of
Cranberry Bogs
at
Fuel Spill-1 and Fuel Spill-28
January 28, 1998**

Meeting Minutes

Attendee:	Address:	Telephone:
Col. John Selstrom	AFCEE HQ	210-536-3383
Jim Snyder	AFCEE/MMR	508-968-4670
Larry Groner	US Air Force	703-693-7312
Jay McCain	US Air Force	703-696-9091
Michael Minior	AFCEE/MMR	508-968-4670
Bud Hoda	AFCEE/MMR	508-968-4670
Doug Karson	AFCEE/MMR	508-968-4670
Walter King	AFCEE/MMR	508-968-4670
Vanessa Musgrave	AFCEE/MMR	508-968-4670
Tom Szymoniak	Jacobs Engineering	508-564-5746
LTC Barbara Larcom	JPO	508-968-5824
Louise House	ASTDR	508-968-4362
Cathy Kiley	MA DEP	508-946-2839
Len Pinaud	MA DEP	508-946-2871
Greg Braun	MA DPH	508-968-4950
Joan Miles	US EPA	617-565-3699
Bob Lim	US EPA	617-223-5521
Steve Hurley	MA Div. Fish & Wildlife	508-759-3406
Matthew Pitts	Ocean Spray	508-946-7650
Kristen Ulbrich	APS	401-274-7200
Virginia Valiela	Town of Falmouth	508-548-7611
Matt Patrick	Town of Falmouth	508-548-7611
Nancy Caffyn	Town of Mashpee	508-477-0025
Jim Begley	Horsby & Witten	508-833-6600
Pat Flynn	Town Hall	508-548-7611
Jeff Lefleur	CCCGA	508-295-4895
Brian Handy	HCT	508-564-4370
Tom Adams	Hatchville Resident	508-540-3626
Frank Caruso	UMASS Cran. Exp. Station	508-295-2212
Daniel H. Augusta	183 Turner Rd. E. Falmouth	508-540-9414
Robert Jones	Town of Sandwich/SMB	508-888-4408
Curtis Frye	Mashpee resident	
Sue Walker	Sandwich resident	508-477-1386
David Carignan	Falmouth Board of Health	508-548-7611
Kris Barrett	39 Nathan Ellis Highway	508-477-4818
George Costa	Town of Mashpee	508-539-1400
Robert Whritenour	Exec. Secretary Mashpee	508-539-1400
Ray Cottengaim	CoE	508-968-4670
Esther Chalom	CoE	212-264-0134
Chris Phillips	Ocean Spray	508-946-7318
Paul Ott	Enterprise Newspaper	508-548-4700

Bob Sherman	Mashpee Conservation Assoc.	508-539-1414
Elaine Krueger	MA DPH	617-624-5757
Bill Chaston	Hatchville Bog Owner	
Frank Ciavattieri	US EPA	617-573-5710
Paul Taurasi	MA DEP	508-946-2712
Jay Healy	Food & Agriculture Dept.	
Ken Reback	MA Div. Fish & Wildlife	
John Johanson	Conservation Commission	508-539-1414
Bob Jones	Town of Sandwich	508-888-4408
Gail MacRae	Hatchville resident	508-540-1202
Brian McDermott	Falmouth resident	
Dave Sharp	Mashpee Conservation Comm.	508-539-1414
Jane Moran	OpTech	508-759-6989
Mary Meli	OpTech	508-759-6989
Facilitator:	**Organization:**	**Telephone:**
John McGlennon	CBI	617-492-1414

Goals of Meeting, Groundrules, and Agenda Review

Mr. McGlennon convened the meeting at 6:00 P.M. He asked the attendees to use the microphones and to identify themselves when speaking. He briefly reviewed the agenda and explained the groundrules of the meeting, saying that there would be time allotted for questions and comments following each agenda item.

What are the Remedial Actions and Investigations Currently Taking Place at Fuel Spill-1 (FS-1) and FS-28?

(see attachments #1 and #2 which include all slides shown during presentation)

Mr. Karson of the Air Force Center for Environmental Excellence (AFCEE) introduced Mr. Szymoniak of Jacobs Engineering. He described the location of FS-28 and reported that 70 monitoring wells had been installed in association with FS-28 between 1996 and 1997. He also stated that the highest concentration of ethylene dibromide (EDB) detected in those wells was 16 parts per billion (ppb).

Mr. Karson reported that the Southwest Operable Unit (SWOU) consisted of a vast amount of acreage. He stated that the fieldwork at the SWOU would provide information on the extent of the contamination and would include the installation of 60 monitoring wells. He then stated that water and sediment testing would also be conducted on several ponds and rivers.

Mr. Karson stated that sentry wells had been installed north of the Coonamessett supply wells. He stated that the sentry wells that were installed were about 400 feet north of the water supply well and that although EDB had been detected in a sentry well, it had not been detected in the actual supply well. Mr. Karson then stated that extraction well 1 (ew-1) had been in operation since September 1997 and that 80% of the plume was expected to be captured at this point. Mr. Karson also stated that due to the operation of the extraction wells, there were low levels of dissolved oxygen in the water which maybe harmful to some fish. He mentioned that there had been a breakthrough of EDB in one of the carbon canisters.

Mr. Karson stated that EDB concentrations in the surface water appeared to be lowered when the cranberry bogs were flooded as the water used to flood the bogs prevented the EDB from surfacing.

Mr. Karson reviewed the situation at FS-1. He stated that FS-1 discharged into the Quashnet River. He also said that the highest surface water detection of EDB was 1.43 ppb and that 15 monitoring wells were scheduled to be installed to ascertain the groundwater quality to the south of this area.

Questions and Comments

Ms. Valiela, a Falmouth Selectman, referred to river and surface water sampling and asked Mr. Karson how far along the plume EDB had been detected. Mr. Karson replied that the EDB had been detected as far down as route 28. Ms. Valiela asked how often samples were being taken along the river and what the results were of those samples. Mr. Karson replied that the surface water sampling to which he had referred was from October and that sampling was being done on a quarterly basis.

Ms. Valiela asked how long it would take for EDB to exit by route 28. Mr. Szymoniak replied that he did not have the pump test results with him but that there was a fairly rapid upwelling. Ms. Valiela asked if the surface water was measured to determine how fast it was moving. Mr. Szymoniak replied that nine locations had been measured last year.

Mr. Lefleur, of Cape Cod Cranberry Growers Association (CCCGA), asked Mr. Szymoniak if he had any indication of the location of the second lobe. Mr. Szymoniak replied that wells were being monitored and that sampling was being done but that the geology was different, which may explain the slow down. Mr. Lefleur asked if it was probable that it would surface. Mr. Szymoniak replied that he did not know but that the model indicated that it would.

Mr. Sharp of the Mashpee Conservation Commission, asked where FS-1 entered the Quashnet River and what the dimensions were at that point. Mr. Karson pointed out where FS-1 entered the Quashnet River and stated that it was less than 1000 feet wide. Mr. Karson then referred to slide of the FS-1 ground water results from the Fall of 1997 and said that it was approximately 100 feet thick.

Ms. Caffyn, a Mashpee selectman, asked Mr. Karson if air samples were taken at FS-1. Mr. Karson replied that there were none taken for FS-1. Ms. Caffyn asked Mr. Karson about the status of fish studies. Mr. Karson replied that a fish study was being funded by the Air Force but it was not directly related to the investigation of groundwater and surface water quality.

Ms. Caffyn asked if there were plans for air sampling to be done at FS-1. Mr. Karson acknowledged the importance of the issue and stated that it would be done if deemed appropriate.

What are the Public Health Concerns at FS-1 and FS-28?

Ms. Krueger, of the Massachusetts Department of Public Health (MA DPH), sitting in for Suzanne Condon, stated that the primary concern at both FS-1 and FS-28 was that EDB was a potent carcinogen. She stated that the exposure pathways were the concern and that EDB has been detected in the cranberries, drinking water, and the air and had also effected fish and wildlife.

Ms. Krueger stated that when the problem first presented itself in October 1996 the federal agencies and Ocean Spray had been contacted immediately to discuss the marketing issues. The Food and Drug inspectors tested the cranberries that were voluntarily chosen not to be entered into sale. Ms. Krueger also said that there were a number of public health issues in terms of public exposure. Subsequently, the MA DPH had met with each of the agencies to address some of the plume safety issues in an attempt to work out a plan that would allow for a safe harvest. However, that plan had not succeeded. She added that there had been more testing in August at the Coonamessett River bog and the Quashnet River bog and that trace levels of EDB had been detected.

Ms. Krueger stated that there were some technical lab issues and that an interagency group would be involved. The Environmental Protection Agency (EPA) and the DPH were sponsoring an effort to get people together to resolve the technical questions that were being raised as well as to develop a protocol for collecting and testing the berries. She added that the biggest concern was to ensure safety for public consumption.

Ms. Krueger stated that there had been many questions about the exposure to the air. She said that while the DPH did not think there was a health risk at this time, more air monitoring would be recommended. She also stated that there should be some follow-up testing on the fish studies. Ms. Krueger then added that shellfish had also been sampled and were proven to be non-detect.

Question and Comments

Mr. Sherman, of the Mashpee Conservation Association, pointed out that many pedestrians spent time along the Quashnet bog and stressed the importance of air sampling.

Ms. Krueger stated that a meeting was scheduled for February 9, 1998 to develop a protocol for sampling for EDB. Col. Selstrom agreed that a protocol was needed and asked when the protocol could be expected to be in place. Ms. Krueger replied that it may take more than one meeting to determine the actual protocol but that she hoped to have it sooner than later.

Mr. Healy, of the Department of Food and Agriculture, stated that risk assessment was often discussed but did not help with economic concerns. He then said that there had to be zero detect levels and that the cranberries would not be marketable with even a trace of EDB.

Ms. Caffyn stated that EDB should be non-detect in the water and the soil in which the cranberries were grown.

Ms. Valiela noted that Ocean Spray had stated that clean berries harvested from contaminated water were not acceptable. She emphasized the importance of the protocol and asked when it would be in place. Ms. Krueger replied that the protocol would be in place as soon as possible.

Mr. Sharp asked how long it would be before the Quashnet River bogs could expect a marketable crop. Mr. Healy replied that that would not be until at least a year of non-detect results. Mr. Sharp asked how long the bogs had to be maintained before they could think about a marketable crop. Mr. Lefleur replied that it was dependent on the clean-up process. Mr. Healy stressed the commitment to "keep holding people's feet in the fire" to ensure reimbursement. Mr. Healy concluded that the question was unanswerable at this time.

What are the Ecological Concerns at FS-1 and FS-28?

(see attachment #3 which contains all slides included in presentation)

Mr. Hurley of the Division of Fisheries and Wildlife introduced himself and Mr. Reback from the Division of Marine Fisheries. Mr. Hurley stated that the wild brook trout had greatly reduced in abundance over the years. He explained that southeastern Massachusetts had experienced almost 400 years of development which had resulted in impacts to the natural environment of the fish. He reported that the trout needed high quality, cold water with a high oxygen level in order to prosper. He explained that the trout were a sentinel species which sought to spawn their eggs in a location were groundwater was coming up in the stream. The spawning typically occurred in the fall and the eggs incubated in the gravel over the winter season.

Mr. Hurley next referred to the river herring. He explained that the river herring lived predominantly in salt water but spawned in freshwater ponds and rivers. He said that the river herring sought strong currents when determining where to spawn.

Mr. Hurley went on to explain the connection between the fisheries resource and FS-1 at the Quashnet River and FS-28 at the Coonamessett River. He said that the Quashnet River was a wild brook trout spawning area as well as a habitat for herring and rare species such as the spotted turtle. At the Coonamessett River, there was a certified vernal pool near the FS-28 treatment well, among other concerns. He then mentioned that there was some potential for the Coonamessett River to restore the wild brook trout.

Mr. Hurley next mentioned the impact of cranberry bogs on fisheries. The main concern was the conversion of a natural river into a main bog ditch. The chemicals from the bogs were also concern. Mr. Hurley added that the impacts from the bog operation were also taken into account.

Mr. Hurley discussed the impact on the fisheries from the fuel spills. He stated that there were no known ecological impacts from EDB. He also stated that EDB had a low bioaccumulation factor and therefore did not easily build up in the fish.

Mr. Hurley stated that the clean-up of the fuel spills would also have an impact on fisheries.

Mr. Hurley listed the wildlife values of reverting the cranberry bogs and mentioned that many bogs interrupted the natural state of the rivers. He stated that a possible problem in reverting the bogs would be the potential overgrowth of stream channels.

Questions and Comments

Mr. Whritenour, executive secretary of the town of Mashpee, asked about the brook trout spawning habitat in relation to the Quashnet River in Mashpee. He also asked Mr. Hurley to explain how the clean-up program would disturb the spawning habitat. Mr. Hurley replied that the wild brook trout sought out areas where the groundwater was upwelling. The installation of an extraction well would alter the groundwater area where the fish spawned. He added that the dissolved oxygen levels may also be a problem. Recirculating wells, however, would not interrupt the spawning habitat as much.

Mr. Whritenour asked Mr. Hurley if it would be possible to do some type of replication of habitat while involved in the clean-up process. Mr. Hurley responded that both replication of habitat and clean-up could occur. He said that the separation of the bogs from the stream may be a solution

and perhaps something may be incorporated in the clean-up process. He also stated that the ecological risk from EDB to the fish was fairly minimal.

Mr. Whritenour pointed out that Mashpee actively farmed the cranberry bogs and that 100% of the funds that were received from those operations were used for a conservation process or the acquisition of conservation lands to protect habitats. He also stated that a significant commitment was made to Mashpee to use this resource to help other conservation resources.

Mr. Taurasi, of the Massachusetts Department of Environmental Protection (MA DEP), stated that he understood that Mr. Hurley had said that EDB was not a problem in the fisheries. He then said that the test results from October 6, 1997 from the Quashnet River had shown EDB at .12 ppb in the brook trout and .13 ppb in the white sucker. Mr. Taurasi asked Ms. Krueger if those levels were a problem.

Ms. Krueger replied that the size of the fish were taken into account as well as the particular assets of that survey. She then stated that DPH was surprised to see EDB in the fish but added that these were trace levels that did not pose a public health concern at this time. She also said that more fish surveys should be done to get a better picture of the situation.

Mr. McDermott, a resident of Falmouth, asked whether the treatment plant on the Coonamessett River was a physical barrier for the migration of fish or any other species. Mr. Reback responded that the treatment plant itself was not a barrier but that the discharge pipe may be a problem and was currently being reviewed.

Mr. Lefleur stated that this industry had made tremendous steps in preserving and protecting 52 thousand acres of land in southeastern Massachusetts. He stated that this area had some very important wildlife and was the third most densely populated state in the country. This area would see a tremendous amount of growth in the next ten years and the livelihoods of the cranberry growers were threatened as well as additional open space. He then said that there was a direct benefit to having this industry here because of the value of the open space and wild life habitat. Mr. Lefleur then stated that the surrounding uplands and wetlands also had to be taken into account.

Mr. Hurley agreed with Mr. Lefleur to an extent. Mr. Reback stated that the Cranberry Growers Association was helping in the decision process.

What are the Criteria for a Marketable Crop from the Bogs?

Mr. Healy stated that the cranberry operators were family farmers who had invested their lives in these bogs. He also thanked some of the people from the Air Force, but added there were tremendous problems in terms of national leadership. He then stated that he had never run into a more recalcitrant group of people who have refused to do the right thing and help folks whose land and water had been ruined through no fault of their own. Mr. Healy thanked everyone who had been involved in obtaining the $800,000, which brought a lot of attention to Mashpee and Falmouth. He then asked what the best case scenario would be in terms of the clean-up process. He stated that this process should not occur repeatedly and that a precedent needed to be set now, not only for the family farmers, but for the towns as well. Mr. Healy went on to say that this was a very important issue and asked the Air Force to take the time to help change the policy in Washington. He added that the crops were not marketable now and that the Air Force needed to

do right by the towns and the family farmers.

Mr. Lefleur stated that the production of a marketable crop was a reoccurring issue. He said stated that the position of the industry had not changed much; if anything, it had become stronger in the sense that all of the impacted handlers and growers had unanimously decided not to utilize their fruit. He added that this decision had been made prior to the detection of the EDB in the fruit. Mr. Lefleur stated that the primary issue pertaining to obtaining a marketable crop was to have clean water. He also said that the establishment of a protocol for sampling and analysis was a critical component for speaking with one unified voice.

Questions and Comments

Mr. Handy, of Handy Cranberry Trust, stated that he was disturbed by the time frame being discussed by the military. He said that one third of the 75 acres that he farmed was effected and that not one person in this room would be too happy if one third of his income were wiped out. He felt that the testing protocol was a waste of time. It was known that EDB was in the water, everybody agreed that it was in the water, and it needed to be *out* of the water.

Mr. Handy then stated that he was upset about the comments made by the Division of Marine Fisheries about the bogs. He said that he did not recall seeing anyone from the Division of Marine Fisheries working on the Coonamessett or Quashnet River, but the Handy Cranberry Trust had installed fish ladders and cleaned up the rivers. Mr. McGlennon stated that Mr. Hurley's presentation had covered various ecological concerns relating to the clean-up process.

Rep. Cahir stated that some of the frustrations that he heard were about the continual delays and the bureaucratic issues. He said that he and Senator Rauschenbach would continue to attempt to accelerate the reimbursement process.

Mr. Adams, a local cranberry grower, said that he could not reiterate enough that the only issue here should be that the water had to be non-detect for EDB. This was the only issue that mattered.

Mr. Healy stated that a tremendous amount of time had gone in to obtaining the $800,000 and encouraged the Air Force to continue to seek funds. He hoped that the process would not be so difficult in the future.

Mr. Snyder, of AFCEE, stated that at this time only a small portion of FS-1 had been identified. He said that there was the equivalent of an earthen damn that was leaking and there was a small possibility of stopping the leak. He stated that problems occurred during the Fall Harvest plan. The balance of the fisheries impact and the current from the treated water also had to be addressed. He then said that there was no straightforward engineering problem and that he did not see a guarantee that the river would be non-detect at any time. Mr. Snyder then said that he did not want people to have false illusions that non-detect water was a prudent real goal. It may be, however there was no guarantee at this time.

Mr. Lefleur stated that a long-term clean-up process was in store. He also said that there was no home for the 1998 cranberry crop and that some immediate problems needed to be addressed. He hoped that tonight's meeting would stress the importance of the immediate need for compensation in 1998 and added that both long-term and short-term solutions were necessary.

Mr. Healy stated that he appreciated Mr. Snyder's honesty but felt that reimbursement was a

separate issue.

Mr. Ciavattieri, of the United Stated Environmental Protection Agency, requested that Col. Selstrom of AFCEE, address the group soon about the reimbursement and the potential loss of the 1998 crop. He inquired about the position of the Air Force and what they intended to do.

What are the Town's Concerns?

Mr. Whritenour read the list of Mashpee's recommendations and expectations (see attachment #4). He then said that the Handy Cranberry Bogs had changed dramatically in the last five years. The town share used to be approximately $25,000 and was now $100,000. He explained that the town leased the bogs to Mr. Handy and that it was very likely that the lease, when up for renewal, would automatically be turned over to Mr. Handy so that he could benefit from all of his hard work. Mr. Whritenour then stated that serious decisions needed to be made in terms of bog maintenance, increase of capital, and lease arrangements.

Ms. Valiela stated that Falmouth had the same concerns as Mashpee (see attachment #5). She recommended that this group reconvene when more information had been gathered. She then encouraged the DPH to move forward on the testing protocol issue.

Questions and Comments

Mr. McDermott stated that the Coonamessett river appeared to be dead. He said that he understood that, until the plume cleared, there would be EDB in the river. Mr. McDermott also said that he would like to see a free flowing river full of herring, trout, and life as well as compensation for the cranberry growers. He concluded by saying that the river should be in harmony with nature.

What are the Short (this year), Mid (two to five years) and Long (five plus years) Options for Proceeding?

Col. Selstrom thanked everyone for the attending. He stated that in December of 1997 he and Mr. Lefleur had discussed the disbursement of the $800,000. He stated that there had been legislation last year because that had been the only way to obtain the funds within the scope of authority. He said that he hoped that this meeting would solidify the recommendations that he would take back to the Pentagon.

Col. Selstrom then stated that the goals of the cranberry bogs and the fisheries seemed to be in competition and that somehow a win/win situation needed to be reached. He said that the protocol was important because very little was known about EDB. Col. Selstrom then said that Mr. Healy had pointed out earlier that there was a two tier process, the 1998 crop and future effected crops. He concluded by saying that recommendations would be made to the Pentagon that an effort would be made to keep everyone well informed.

Ms. Caffyn asked Col. Selstrom if it were true that the rivers might never be free of EDB. Mr. Snyder remarked that he had said earlier that there was no engineering certainty at this point to guarantee that the rivers could be non-detect. He said that there was a difficult engineering problem. Ms. Caffyn said that the achievement of the present goals depended on the fact that the rivers would return to non-detect. She then asked when this information would become available. Mr. Snyder replied that according to the schedule for FS-1, there should be a proposal by January of 1999.

Col. Selstrom stated that monies for remedial action were being identified but what that action would be was still not known.

Ms. Walker, a Sandwich resident, stated that the cranberry growers had been reimbursed last year because of the EDB in the fruit and added that Ocean Spray had a standard that the water had to be non-detect for the entire growing season. Mr. Lefleur stated that all handlers of fruit held to that standard.

Mr. Healy asked Col. Selstrom when he was planning to go to the Pentagon with the recommendations. Col. Selstrom responded that he was awaiting the results of the February 9, 1998 meeting on protocol.

Ms. Valiela said that the towns would like to know if the recommendations that Col. Selstrom brought to the Pentagon would be different from the recommendations from the towns of Falmouth and Mashpee.

Mr. Patrick, a Falmouth selectman, asked about long-term compensation. He stated that the towns and cranberry growers should not have to depend on legislation each year and that there should be a line item in the budget for compensation. Col. Selstrom said that he appreciated that comment and would take it into consideration.

Mr. Lefleur stated that Col. Selstrom needed to leave tonight knowing what the decided recommendations were. He said that the long-term decision matrix was unclear but, that the towns and growers did not wish to give up cultivation of the bogs. They wanted to maintain the bogs and they had to be compensated for their losses. Mr. Lefleur stated that everyone had agreed upon the compensation and added that the long-term issues also needed to be addressed.

Mr. McDermott asked how much of the $800,000 represented cost of production versus loss of profit. He said that it would seem that if the berries were not grown there would then be a savings in damages and compensation. The compensation would be for the loss of the cranberries only, not for the cost of production of the cranberries as well. Mr. Lefleur responded that the properties needed to be maintained in order to efficiently go back into production when the time came.

Mr. Caruso, of the University of Massachusetts Cranberry Experimental Station stated that the best case scenario would be that that the clean-up proceeded as quickly as possible and there would not be a marketable cranberry crop for a number of years. He went on to say that, despite the fact that there would not be a marketable crop for some time, it was still important to keep the bogs free from disease, insects and weeds that would deem them non-productive. Mr. Caruso reiterated that the bogs needed to be well-maintained so that when they got back on line, they would be right where they should be.

Mr. Taurasi thanked Col. Selstrom for the work that he had done. He also stated that the size of the FS-1 plume was not known and asked whether treatment at FS-1 could start now despite the fact that the totality of the plume was unclear.

Mr. Snyder replied that FS-1 was a different situation than FS-28. He stated that FS-1 had more of a spring flow to grab which created a problem. Mr. McGlennon asked if an interim treatment could be used during the process of the investigation. Mr. Snyder said that yes, he would consider that option.

Ms. Caffyn stated that Col. Selstrom was "hanging his hat" on the protocol issue. She said that the issue was clean water and she did not want to see a delay due to the protocol issue. Col. Selstrom asked how it could be demonstrated that all was Okay if there was no attention to protocol. Again Ms. Caffyn stressed her concerns about placing so much emphasis on the protocol. Col. Selstrom stated that he appreciated Ms. Caffyn's concerns.

Ms. Krueger stated that because food was growing in a potential hazardous waste site, the protocol was important. She added that this was not a normal situation. Mr. Lefleur stated that protocol would be valuable in assessing the timing of the next marketable crop. However, there was no marketable crop in 1998 and protocol was not needed to address that issue. Mr. Healy agreed with Mr. Lefleur.

Col. Selstrom stated that it was a judgment call and that he was not going to play "kick the can down the road". He said that he wanted to solve the problems all at once.

Identify Next Steps

Mr. McGlennon stated that the next step would be the February 9, 1998 protocol meeting. He also said, and that Col. Selstrom would consider alternative compensation approaches for 1998 and beyond. Mr. McGlennon asked whether the group would like to meet again.

After some discussion, it was decided that the group would meet again on March 4, 1998 from 6:00 P.M. to 9:00 P.M. Mr. McGlennon stated that the funding issue, the protocol issue and updates on FS-1 and FS-28 would be on the agenda for the upcoming meeting.

Adjourn

Mr. McGlennon thanked everyone for attending and adjourned the meeting at 8:55 P.M.

(2)

3 MARCH 1998 AGENDA, MEETING MINUTES

A FOLLOW-UP WORKING MEETING ON THE PRESENT AND FUTURE STATUS OF CRANBERRY BOGS AT FS-1 AND FS-28

Tuesday, 3 March 1998
6:00 -- 8:30 PM
Building 330, Massachusetts Military Reservation

DRAFT AGENDA

GOAL

- To provide a follow-up discussion of key issues raised at the 28 January Working Meeting.

DRAFT AGENDA

6:00 **Introductions**
Participants Introduce Themselves

6:10 **Goal of Meeting, Groundrules, and Agenda Review**
CBI Facilitator

6:20 **Review of the criteria for a marketable crop from these bogs**
Jeff LaFleur, Cape Cod Cranberry Growers

6:30 **Summary of the Work of the Cranberry Testing Protocol Working Group**
Greg Braun, Department of Public Health, Cranberry Protocol Working Group Spokesperson

6:45 **Questions and Comments**

7:00 **Air Force Presentation**

Lt. Colonel Jim Lyon, Air Force Center for Environmental Excellence, Environmental Restoration Division

7:20 **Response and Comment from the Affected Parties**
Cranberry Growers and Mashpee and Falmouth Town Officials

7:40 **Response and Comment from the Environmental Agencies**
Environmental Protection Agency and Massachusetts Department of Environmental Protection

8:00 **General Questions, Comments and Discussion**

8:15 **Identify Action Items and Next Steps**
All Participants

8:25 **Select Spokesperson to Report to the Senior Management Board**

8:30 **Adjourn**

GROUNDRULES

In order to keep the meeting focused and constructive, we at CBI recommend a few groundrules. They are:

- presenters and speakers will avoid using acronyms and/or will clearly "translate" acronyms for participants.

- each organization should select one spokesperson to sit at the "first table". All others will sit behind their representatives at the "second table".

- representatives at the table will engage in the majority of the dialogue. If others want to speak, they should do so at the behest of their representative. If time allows and these participants agree, there will be a period for comment by other attendees at the end of each question and answer session.

- representatives should strive to be clear about their concerns and interests, and be as prescriptive and constructive as possible in terms of recommending future actions/efforts.

DIRECTIONS

From the Falmouth gate, drive into MMR. At the blinking red light, continue straight. Up several hundred yards to your right will be a new brick building with a glass entry way and a parking lot in front. This is building 330.

From the Otis Rotary, drive past the new National Cemetery, past an empty guard house, to the first rotary on base. Travel not quite 180 degrees to the road off to the right, which jogs quickly to your left. Jog left, traveling on this road past large buildings on left and right. At East Inner Road, take a right and travel to next rotary with a fighter airplane in the center (the 2nd rotary on base you have entered). Go 180 degrees (1/2) around this rotary and continue on straight very briefly. The second building on your left, set back from the road, is Building 330.

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Follow-up Working Meeting on the Future and Present Status of Cranberry Bogs at Fuel Spill-1 and Fuel Spill-28
March 3, 1998

Meeting Minutes

Members of the Panel:	Organization:	Telephone:
Col. John Selstrom	AFCEE HQ	210-536-3383
Carl Pavetto	Joint Program Office	508-968-5824
Virginia Valiela	Falmouth Selectman	508-548-7611
Allan Gordon	Falmouth Cons. Comm.	508-289-2404
Jo Ann Muramoto	Falmouth Cons. Comm.	508-548-7611
Nancy Caffyn	Mashpee Selectman	508-477-0025
John Johanson	Mashpee Cons. Comm.	508-539-1414
Bob Jones	Sandwich Selectman	508-888-4408
Rick Musiol	Sen. Murray's office	508-746-9332
Dan Augusta	cranberry grower	508-540-9414
Tom Adams	cranberry grower	508-540-3626
Brian Handy	Handy Cranberry	508-564-4370
Jeff LeFleur	Cran. Growers Assoc.	508-295-4895
Steve Hurley	MA Div. Fish & Wildlife	508-759-3406
Elaine Krueger	MA Dept. Public Health	617-573-5710
Paul Taurasi	MA DEP	508-946-2712
George Crombie	EOEA	
Frank Ciavattieri	US EPA	617-573-5710
Tom Cahir	MA State Rep.	
Bob Sherman	Mashpee Cons. Comm.	508-539-1414
Pat Flynn	Falmouth Selectman	508-548-7611

Attendees:	Organization:	Telephone:
Jim Snyder	AFCEE/MMR	508-968-4670
Jim Lyons	AFCEE	
Mike Minior	AFCEE/MMR	508-968-4670
Paul Marchessault	US EPA	617-573-5793
Patty Tyler	US EPA	
Len Pinaud	MA DEP	508-946-2871
Steven R. Ball	Mashpee Cons. Comm.	508-539-1414
Doug Karson	AFCEE/MMR	508-968-4678
Ray Cottengaim	Corps of Engineers	508-968-4670
Bruce Roy	Joint Program Office	508-968-5908
Eric Banks	Jacobs Eng. Group	508-564-5746
Jack Crooks	Ocean Spray Cranberries	508-946-7582
John Henry	Ocean Spray Cranberries	508-946-7447
Robert Chesson	Foothills Eng. Consult.	303-278-0622
Joan Miles	US EPA	617-565-3699
Cathy Kiley	MA DEP	508-946-2839
Frank Caruso	U. Mass Cran. Station	508-295-2212
Louise House	ATSDR	508-968-4362

Attendees: (continued)	Organization:	Telephone:
Thomas Bicki	Ocean Spray Cranberries	508-946-7128
Greg Braun	MA Dept. Public Health	508-968-4950
Mark Forest	Cong. Delahunt's office	
LTC Barbara Larcom	Joint Program Office	508-968-5824
Larry Groner	Air Force Off. Gen. Cnsl.	703-653-7312
Jay McCain	AFLSA	703-696-9091
Kent Gonser	Joint Program Office	508-968-5824
Bud Hoda	AFCEE/MMR	508-968-4670
Ed Pesce	AFCEE/MMR	508-968-4670
Dave Carignan	Falmouth Health Dept.	508-548-7611
Vanessa Musgrave	AFCEE/MMR	508-968-4678
Ellie Grillo	MA DEP	508-946-2866
Marty Aker	AFCEE/MMR	508-968-4971
Betsy McEvoy	Senator Kerry's office	617-565-8519
David Dow	Sierra Club	508-540-7142
Kris Barrett	Jacobs Eng. Group	508-564-5746
Laurie Ekes	Jacobs Eng. Group	508-564-6192
Sue Walker	PIT	508-477-1386
Tim Forden	Jacobs Eng. Group	508-564-5746
Tom Szymoniak	Jacobs Eng. Group	508-564-5746
Mary Meli	OpTech	508-759-6989
Jane Moran	OpTech	508-759-6989

Facilitator:	Organization:	Telephone:
John McGlennon	CBI	617-492-1414

Agenda Item #1. Welcome and Introductions

Mr. McGlennon convened the meeting at 6:00 P.M. and asked the panel and audience members to introduce themselves.

Agenda Item #2. Goal of Meeting, Groundrules and Agenda Review

Mr. McGlennon reviewed groundrules for the meeting. He asked that the speakers around the table avoid the use of acronyms. He explained that he could not guarantee that he would be able to take questions from the audience as the goal of the meeting was to get together those people at the table - the selectmen, the cranberry growers, and the officials dealing with the Installation Restoration Program (IRP). He also asked that all speakers identify themselves and their affiliation each time that they speak.

Mr. McGlennon then reviewed the agenda. There were no suggestions to change or amend the agenda.

Col. Selstrom of the Air Force Center for Environmental Excellence (AFCEE) reported that last Friday their offices in Washington, D.C. had provided to Jim Snyder, AFCEE/Massachusetts Military Reservation (MMR) the compensation agreements to compensate the growers for the 1997 crop. Once some funds were transferred and the compensation agreements were sent back, the payments would be made. Col. Selstrom noted that closure was being reached on this issue and thanked Mr. LeFleur of the Cape Cod Cranberry Growers' Association (CCCGA) for his assistance in this matter.

Agenda Item #3. Review of the Criteria for a Marketable Crop from the Cranberry Bogs

Mr. LeFleur of CCCGA explained that throughout the entire process of developing the testing protocol, the issue of the purpose of the protocol continued to come to the surface. He said that even before testing the fruit, the underlying requirement for all handlers was that the water used throughout the growing season and during the harvest be clean and ethylene dibromide (EDB) free. If EDB detections were found at any time during the growing season or the harvest, that entire year would essentially be written off.

Mr. LeFleur noted that the upcoming presentation by Mr. Braun of the Massachusetts Department of Public Health (MDPH) focused on the testing of the fruit itself. This would become important once the water was clean. Once there had been an entire year of clean water, a clean bill of health for the fruit would become important for the production of a marketable crop. He stressed that clean water was necessary and mandatory for a marketable crop.

Agenda Item #4. Cranberry Testing Protocol Working Group Summary

Mr. Braun of MDPH introduced himself and explained that the protocol working group, a joint effort with the United States Environmental Protection Agency (US EPA) and several other agencies, had reviewed the analytical procedure for cranberries. He said that he would be providing a quick overview of some of the issues that had been studied (see attachment #1 for all slides shown during the presentation).

Mr. Braun then listed the various agencies who had participated in the Protocol Working Group. He explained that the group's objective had been to establish unified sampling and analysis protocols for EDB in cranberries for food safety concerns. This had been broken down into cranberry collection protocols, cranberry analytical protocols, and data review and release procedures. He then read through the collection protocol agreements and the analytical protocol agreements and went on to explain the analytical decision tree.

Mr. Braun apologized for the use of abbreviations in the decision tree. He informed the group that GC/ECD stood for gas chromatography/electron capture detection and explained that GC/ECD was used with dual column confirmation in the decision tree. He said that this was the methodology used historically by the state laboratory. Mr. Braun continued to read through the decision tree. If non-detect for EDB, and it was agreed that the two columns had less than a 25% difference, it was then reported as non-detect. If EDB was detected and it was to be used for the state ECD method, the detection would have to be greater than ten times the reporting limit to be a reportable detection. Otherwise, if the detection was less than ten times the reporting limit, it would have to go through gas chromatography/mass spectography/selected ion monitoring (GC/MS/SIM) methodology which was a more specific methodological approach.

Mr. Braun then reviewed the preliminary data reporting requirements and the comprehensive data reporting requirements. He then spoke about the Future Action Items for the Cranberry Testing Protocol Working Group. He said that MDPH would prepare a draft sampling protocol by mid April, 1998 which would then go back to the group for comments and recommendations. These would be incorporated into a June, 1998 final document. He also said that US EPA would prepare a draft analytical protocol document by mid April, 1998.

Agenda Item #5. Cranberry Testing Protocol - Questions and Answers

Ms. Krueger of the MDPH noted that the draft sampling protocol would be sent out for an independent peer review before it was finalized. This was an additional step that the MDPH would like to do.

Ms. Valiela, Falmouth Selectman and Senior Management Board (SMB) member, asked Mr. Braun to show the decision tree slide again, which he did. She asked for clarification as to how the method detection limit (MDL) of 0.04 parts per billion (ppb), which had been mentioned in the previous slide, fit

into the decision tree. She asked if .03 ppb would be reported as non-detect. Mr. Braun agreed that was the case. He also said that .05 to .4 would be suspect detect and would have to go through the mass spectrography protocol for validation. Ms. Krueger agreed and added that this sounded good and was sensitive. Ms. Valiela agreed and said that she wanted to be sure that the MDL clearly tied into the area of the decision tree where greater than or less than ten times the reporting limit was discussed. Mr. Braun apologized that the information was not as clear as it might have been. He explained that it had been watered down considerably so that it could be more easily understood. He added that the final document would include a much more refined flow chart. Ms. Valiela noted that it was important that the citizens understand the protocol and she thanked Mr. Braun.

Mr. Bicki of Ocean Spray questioned the MDL for 1998 and noted his concern about a moving target. He explained that if the MDL for 1998 was .04, a detect of .03 would be non-detect. But if the detection limit were to drop to .02 in 1999, then it would become questionable and suspect whether the fruit from the previous year had been free of EDB. For the sake of consistency, he recommended a firm MDL which would not change. Mr. Braun replied that that would be ideal. However, the concern had been that as the analytical methodology progressed, the detection level would be driven down and the desire would be to use the most accurate and sensitive measurement available. He agreed that it was hard to circumvent Mr. Bicki's point, but maintained that as more information became available, the MDL may have to be re-addressed in the future.

Mr. Jones, Sandwich Selectman, asked how the methodology of detecting EDB in the fruit compared with the methodology of detecting EDB in the water itself. Mr. Braun replied that his understanding was that the methodologies were comparable, but that the water analysis was somewhat more sensitive because the cranberries were a difficult material with which to work.

Ms. Muramoto, Falmouth Conservation Commission Administrator, asked about EDB in the cranberry vines. She wondered if there was a chance that EDB could be transported from the vines to the berries. Mr. Braun replied that this answer was not definitively known. However, Armstrong Laboratories had done an absorption study with berries using a controlled environment and this had indicated some absorption into the berries. He did not know if there had been any root uptake studies.

Mr. LeFleur said that he had thought there was some literature which showed that EDB was not taken up by the plants. Ms. Krueger said that this was also her recollection. She added that what had been seen were berries which had been in contact with surface water containing EDB.

Mr. LeFleur then agreed with Mr. Bicki that it was important to be consistent with detection levels over a longer period of time. The integrity of the crop from the previous year would be put in jeopardy should the detection levels change and this issue needed to be further explored. Mr. Braun agreed to incorporate this long term market issue concern into future discussions.

Ms. Caffyn, Mashpee Selectman, referred to the action item which stated that the working group would finalize the written guidance document by June of 1998. She voiced her concern that Ms. Krueger had indicated that the MDPH would be conducting an independent group study. She wondered if it would be realistic to have that happen if a draft protocol document was being considered for April 17, 1998. Ms. Krueger replied that peer review was common practice at the MDPH and could be done rapidly, without delaying the schedule.

Col. Selstrom asked if the MDPH peer review would be done concurrently to June, 1998. Mr. Krueger replied that it would depend on the progress, which had been rapid. She assured Col. Selstrom that she was not concerned about the time. Col. Selstrom also said that he was impressed with the way this group had gotten together with a common understanding.

Col. Selstrom then recommended that, regarding the MDL of .04, it should be decided as part of the protocol how changes in that number would be addressed. This needed to be defined. Mr. Braun noted

that this had started as an analytical discussion. Policy issues were outside the scope of what was being presented. Col. Selstrom replied that he understood that, however he was now asking what were the policy issues that needed to be worked through. Ms. Krueger felt that the goal of the working group was to work on a technical protocol so that multiple sets of laboratory data could be avoided. She said that it was not within the scope of that group to address the policy issues. Once the technical protocol was drafted, it would be circulated to the policy people who would then address those policy issues. Ms. Krueger also noted that the MDPH's concern was food safety and so they wanted to be sure that there was no EDB in the fruit.

Col. Selstrom stressed the need for everyone to agree on the process. He said that contact with EDB contaminated water was a policy issue which had to be defined. The question of whether monitoring should be done for compounds of concern other than EDB also needed to be addressed. If the Cranberry Protocol Working Group identified any policy decisions to be made by the policy makers, the question of which policy makers should be involved also had to be addressed so that the right people could get together to make these decisions. Ms. Krueger replied that the policy makers would be looking at this information when it was in draft form. Col. Selstrom explained that he was suggesting not waiting for the draft to come out on April 17, 1998. He recommended identifying the people who could answer these policy questions and move forward.

Mr. Braun pointed out that the Working Group had envisioned the protocol discussed this evening as strictly analytical. Policy issues had not been considered. Ms. Krueger stated that the group had felt that when consensus had been reached on the technical points, the protocol would then go to the policy people. Ms. Valiela stated that on April 17, 1998, a draft analytical protocol would go to all the policy people of the agencies and groups working on this issue. She recommended that another meeting, such as this, occur fairly soon after that, once some of the policy issues had been determined following the review of the analytical protocol.

Lt. Col. Larcom of the Joint Program Office (JPO) explained that she and Ms. Kiley of the Massachusetts Department of Environmental Protection (MA DEP) had both participated with Mr. Braun on the analytical working group. She offered the following technical clarifications: 1) The MDL of 0.04 was a statistical determination based on the method and the analytical procedure. Ocean Spray's laboratory, MDPH's laboratory and the laboratory used by the Air Force had all reached that MDL. Because the technology could change, it was specified that it was a 1998 MDL of 0.04. Next year, the methods may change and the MDL may go lower. 2) The reporting limit was not the MDL. The reporting limit was .1. Ten times the reporting limit would be 1. Anything between .1 and 1 would go for mass spectography confirmation. Something determined between .04 (the limit to the method used) and .1 would be considered a trace amount.

Mr. Adams, a Falmouth bog owner, noted that the newspapers could obtain information which was not meant to be publicized (such as the level between .04 and .1 as non-detect). If the figure of .03 were to be published in the newspapers, who was to say how much was too much. He asked how this sort of scenario could be prevented. Lt. Col. Larcom again clarified that .04 was the MDL, the laboratory was confident that if it was .04 or above, EDB was in fact being seen. To quantitate that, it would need to be at least .1. This was why between .04 and .1, it was considered trace amounts.

Mr. Dow of the Sierra Club suggested that EDB may actually come in through the stamina of the leaves and get to the cranberries in this way rather than through the roots. This seemed to him a more logical pathway.

Mr. McGlennon noted that Mr. Ciavattieri wanted to make a comment prior to the Air Force presentation.

Mr. Ciavattieri, Deputy Director of the US EPA Superfund program, stated that ever since EDB had been discovered in the Coonamessett and Quashnet Rivers, the US EPA had been aggressively pressing the Air Force to develop a long term solution and the means to compensate the cranberry bog owners and

operators for their losses. He said that while the efforts of Col. Selstrom and his staff were acknowledged and appreciated, the US EPA was nevertheless disappointed that the Air Force had not chosen to involve the regulators at US EPA, MA DEP, and MDPH earlier in the process. Regarding the Air Force proposal which Mr. Snyder of AFCEE was about to present, Mr. Ciavattieri noted that the regulators had only received some limited and incomplete information. However, the proposal did ask some important questions which needed to be answered. He explained that any plan proposing to re-route existing river systems and create flooded areas which could result in impacts on existing hydrogeological ecosystems would be subject to many federal and state regulatory requirements. Therefore a very high burden of proof as to why the actions were necessary, what its impacts would be, and what the other alternatives were, would be placed on the Air Force. He asked that the group exercise caution when looking at the proposal and keep in mind these questions which could significantly influence the viability of the plan. Mr. Ciavattieri also noted his interest in hearing how the Air Force proposed to deal with the compensation issue for this year's crop. He then thanked the group for listening.

Mr. Taurasi, MA DEP, noted that his agency shared US EPA's concerns regarding the early conceptual plans. He also commended the Air Force for their efforts in taking a first cut at an innovative solution. He then stressed that it was important that the regulatory agencies and the Air Force work together and develop the plan jointly.

Col. Selstrom told Mr. Ciavattieri and Mr. Taurasi that he appreciated their thoughts. He then emphasized that what Mr. Snyder was about to describe was a concept and he reminded the group that it had only been five weeks since the last cranberry meeting. He said that this concept would require a full and open dialogue, possibly with more players than were presently at the table. Perhaps this was a workable solution, but perhaps it would turn out that an alternative solution would emerge.

Agenda Item #6. Air Force Presentation

Mr. Snyder of AFCEE/MMR pointed out that what he was about to present was a concept. He explained that there were a lot of stakeholders involved in this type of project, such as the regulators and the fisheries. He then proceeded with the Air Force presentation (see attachment #2 for all slides shown during the presentation).

Mr. Snyder recapped what had been said at the January 28, 1998 cranberry meeting. He then gave a brief update on the Fuel Spill-28 (FS-28) plume and showed maps of the Coonamessett River bogs, the FS-28 plume area, and the Coonamessett River surface water sampling locations. He pointed out the area where the plume was upwelling and noted that this had been confirmed by the surface water sampling and the dry point sampling that had been done throughout the bogs. He explained that the Air Force was proposing to separate this area by berming and would then berm along the stream channel. The goal was to separate the location of the surface water containing EDB. The plan was not to pond the water but to create a small series of constructed wetlands to hold the water level to be pumped to the extraction well-1 (EW-1) treatment plant. Mr. Snyder explained that the river channel would be re-routed. If the concept worked, everything north and south of the bermed area would not be in contact with EDB water. Mr. Snyder then reviewed the advantages of the FS-28 proposal and the FS-28 issues as outlined in attachment #2.

Ms. Caffyn asked to see the map of the bog locations before Mr. Snyder went on to discuss FS-1. Mr. Snyder showed the map and Ms. Caffyn asked him to describe where houses were located around those bogs. Mr. Snyder pointed out the residential areas near the bogs. Ms. Caffyn asked if, in the future, there could be maps which included houses. She said that these maps were too abstract, making it difficult to understand the impact. She expressed her concern about air monitoring and explained that this was why she wanted to know the proximity of these homes. Mr. Snyder pointed out the area where an air monitoring event had occurred last year on the Broad River. He said that there had been no unusual expected health risks from the levels that had been detected. Ms. Caffyn asked that air monitoring be put on the Air Force's list and Mr. Snyder agreed to do so.

Mr. Snyder then continued with his presentation by updating the group on FS-1. He showed a depiction of the FS-1 site area and explained that the attempt was being made to define the northern extent of the EDB. He then showed a map of the FS-1 surface water sample locations and a profile of the particle paths discharging to the Quashnet River. Mr. Snyder showed the Quashnet River bogs diversion channel conceptual plan. He pointed out the diversion berms which he explained would not allow the contaminated water to rejoin the Quashnet River until it was below the active bog. He also pointed out an abandoned bog which he noted may have the potential to replace some of the lost acreage. Mr. Sherman of the Mashpee Conservation Commission recommended that Mr. Snyder dispel that notion immediately because of the presence of spotted turtles there which fell under the Native American Species Act.

Mr. Snyder then reviewed the various points of the FS-1 proposal and its advantages as outlined in attachment #2. He reported that the issues were the same as those at FS-28. In summary, Mr. Snyder reiterated that this was a concept only and the Air Force needed input in order to determine the issues and the stakeholders. He also noted the need to develop a working group to implement the plan.

Agenda Item #7. Response and Comment from the Affected Towns

Mr. McGlennon recommended that the group offer their comments and questions about FS-28 and FS-1 separately.

Mr. Crombie of the Executive Office of Environmental Affairs (EOEA) said that the state was looking for the Air Force to come in with a stabilization plan for the cranberry bogs and the cranberry industry, meaning what was going to happen to the bogs for compensation for the coming year. He said that it was his sense that the plans for FS-28 and FS-1 would not be approved and in place for this coming year. He also said that the state would be looking at what was the best available technology to manage both of those plumes - for example, pump and treat or the so-called proposed holding ponds. Mr. Crombie said that they would be looking at air issues, habitats, water, community impacts, etc.

Mr. Crombie also spoke about the testing protocol. He said that this was part of the solution but that protocol would not be approved individually until there was a plan in place dealing with the issues he had just mentioned. He said that they were dealing with plumes that had not been contained and they had a bad actor in EDB - this was an unpredictable situation. Once the situation was stabilized, then the move could be made to set the protocol on how to evaluate from that point on.

Ms. Muramoto said that her question applied to both plumes. She asked what was the approximate volume of water that would be temporarily prevented from returning to the rivers and explained that she was concerned because of problems with oxygen stripping at EW-1. Mr. Snyder replied that the quantity should be zero. The proposed plan did not look to hold the water, but rather to berming it. In this way, the water would be separated, treated, and then reintroduced to the rivers. He agreed that the issue of dissolved oxygen would need to be addressed. Mr. Snyder said that the river flow would not drop.

Mr. Sherman asked Mr. Hurley of the Massachusetts Division of Fisheries and Wildlife (MDFW) to discuss the possible negative impacts on fish as a result of these proposed plans. Mr. Hurley said that this was a complex situation and it was difficult to judge impacts at this point. However, he said that his primary concern at FS-28 would be the alewife run or fish passage. For FS-1, his concerns would be the alewife fish passage as well as the spawning area of the wild brook trout which required cold, well-oxygenated upwelling groundwater. He felt that this plan was not something that could be done easily. He also noted that as a member of the Joint Process Action Team (JPAT), this proposed plan brought back bad memories of the 60% design. Mr. Hurley expressed his feeling that this process was going forward much too fast. He felt that biological and ecological input were needed and recommended that a biologist be hired to study the plan. He explained that he had many other duties and was unable himself to devote the necessary time to the project.

Mr. Hurley also agreed with Mr. Sherman that the abandoned cranberry bog mentioned earlier was indeed a state listed rare species habitat under the Massachusetts Natural Heritage Program.

Mr. McGlennon reminded the group that this was a concept being discussed, not a plan.

Mr. Sherman commented that the Natural Resources Conservation Service should have been involved with this issue from day one and should be invited by AFCEE from now on. He explained that they would have a direct role in any decisions about re-routing water. While he didn't need to know tonight, Mr. Sherman also said that he would like to know the threshold level for surface water after which it would be fenced and the public kept away, as well as how this level had been determined. He also asked who would implement and finance the control of water flow during rainfall and flood events. Mr. Sherman also mentioned that the regulatory issues could be daunting.

Mr. Sherman remarked that this was a complicated matter for the Conservation Commission because they owned the land, the money was derived from the land and was used for Conservation projects including buying land. He also noted that Conservation Commissions were obligated to protect watershed resources. Under the local wetlands protection bylaws, they were obligated to balance a number of issues including wildlife habitat, fisheries, water quality, etc. and this was difficult to do. Mr. Sherman stated that the Commission was interested in further consideration of the conceptual plan but did agree with Mr. Hurley that there was still a great deal to be known about fisheries impacts. He also felt that this issue had taken more of his own time than he could devote and so he seconded Mr. Hurley's suggestion that some qualified, unbiased fisheries and wetland biologists look into these plans.

Mr. Sherman said that he was grateful that things were moving forward and that the Air Force had come up with a conceptual plan. However, in order to maintain moving ahead on all fronts in good faith, Mr. Sherman stated that it was high time that AFCEE made a commitment on the 1998 crop.

Ms. Caffyn remarked that the Technical Review and Evaluation Team (TRET) should be brought in on this proposal. Mr. Snyder reported that the TRET still met on a monthly basis but had not yet been given this conceptual plan as a responsibility. Ms. Caffyn requested that the TRET be charged with the study of this conceptual plan.

Mr. LeFleur said that it was obvious that there were engineering concerns, environmental concerns, and health-related concerns. From the growers' perspective, there were horticultural concerns as well. He noted that all of these concerns had to be addressed but said that this was not going to happen in 1998. The integrity of the growers had to be maintained. He said that they had to look beyond 1998, possibly into 1999 or 2000. He noted that the handlers would not accept the fruit until one year of clean water had been seen. Even if the conceptual plan was to be implemented and completed in 1998, the likelihood of seeing a marketable crop in 1999 was very questionable. Mr. LeFleur said that it would likely be at least three years before there was a marketable crop. Over this next year, all of the alternatives should be examined. Mr. LeFleur said that there were some immediate concerns which needed to be addressed very soon.

Mr. Pavetto of the JPO stated that the Air Force, the Army, and the Deputy Undersecretary of Defense, had been working on the compensation question. He then read the following statement: "Cooperation is essential to protect the cranberries from EDB contamination. We recognize, however, that there can be no certainty that these cooperative efforts can prevent the commercial loss of the 1998 cranberry crop from its effected bogs. The Department of Defense (DoD) is working with the congressional delegation at this early stage of this year's legislative session to address the possibility that compensation can again be warranted." Ms. Caffyn asked Mr. Pavetto to re-read the statement, which he did. Ms. Caffyn then said that the word "possibility" bothered her.

Mr. Adams agreed that he too had a problem with the word "possibility". He also said that the statement was not long enough. He said that the following statement should have been made: "Compensation will

be made to the growers until there is non-detect EDB in the water, for however long, whether it be one year or a thousand years." Mr. Adams stated his belief that this could be done in the legislative process and through the military. He said that he himself did not have enough education to do this, but he felt sure that the Air Force did and that the legislature could write the right words so that the cranberry growers would not have to come back every single year to "pull teeth" to get compensation for that year. Mr. Adams remarked that this should be written in such a manner that compensation for the berries came from that year's dollars.

Mr. Snyder commented that the Air Force was still in the remedial investigation feasibility stage for the ultimate solution. These conceptual plans were not considered the ultimate solutions.

Ms. Valiela stated that the DoD needed to send a clear signal that the process to resolve the compensation issues for 1998 and 1999 had begun. She added that regular bulletins on the status of the compensation process were needed. She commented that this was a complex proposal but felt that if each of the Cnservation Commissions worked with the concept it would soon become clear if it was worthy of the effort that would be needed to make it work. Ms. Valiela then stressed the importance of getting the additional stakeholders involved (such as the Corps of Engineers and the Natural Resources Conservation Service) as well as the importance of identifying other potential stakeholders and permitting agencies. She said that she did not want to have a replay of the 60% design process.

Ms. Valiela also said that, speaking for Falmouth, it was important to get a handle on FS-28 and see whether it was possible to contain a portion of that plume and get the cranberry bogs back into production. She felt that two working groups would be needed for the two plumes due to specific issues, such as the spotted turtle. She also said that she was pleased with the process of the protocol development. However, its focus was on the fruit and she stressed the importance of monitoring to meet the Ocean Spray standard of one year without EDB.

Mr. Cahir, State Representative, said that he wanted to applaud everyone involved with the progress that had been made on the protocol development as well as the technical issues that were being discussed. However, he noted that Mr. LeFleur had indicated that it would be at least three years before there would be a marketable crop. Mr. Cahir then said that it was important to get a commitment to the compensation in the long term.

Ms. Caffyn noted that the group needed to have an idea of the cost to implement the proposed conceptual plan and asked that such information be shared at the next meeting. She also wondered if the United States Department of Agriculture should be brought in to this issue as they paid a lot of people *not* to grow crops. She said that perhaps the cranberry growers could be considered here. Mr. Jones asked, since this was a conceptual plan and it was conceptual where the money would be coming from, whether it would be "fresh" money or, like the water, "diverted" money.

Col. Selstrom replied that there was money in the budget to respond to remedial action. The money was there for specific purposes such as putting in additional wells at FS-28. He said that the money may be diverted to implement a plan for the bogs. He said that the Air Force needed to work through the conceptual plan. He also said that some rough cost estimates had been done. He also reiterated that this was just a concept and that a dialogue had to be built around defining what would really be done.

Agenda Item #8. Response and Comment from the Environmental Agencies

Mr. Ciavattieri said that although it was recognized that this was a concept being proposed, it was clear that there were a lot of hurdles to be overcome. He also said that, on behalf of the US EPA, they were somewhat disappointed with the language of the Air Force's statement. He said that the possibility that cooperation would get them to where they want to be was very unlikely even if everybody "rowed their oar" as fast as possible. The fact that the Air Force said "*may* be compensated" was unacceptable. He also said that he agreed with Mr. Crombie that a remedy to deal with the protection of the cranberry crops was

being sought as was a long term source control plan which needed to be implemented concurrently and aggressively. Also being sought was some guarantee of compensation to be made to the growers and the operators in the interim, while the plans were being developed and implemented.

Ms. Tyler introduced herself as an aquatic biologist and ecological risk assessor with the US EPA and the ecological lead on the TRET. She stated that the February 19, 1998 memorandum which highlighted the concepts of the plan had been received by the US EPA. She said that the agency was still reviewing the plan but felt that there were missing elements that precluded their ability to critically review the plan. She explained that in order for the agency to provide critical input to the plan, a series of technical questions had to be addressed. Examples of such questions follow: 1) Based on the fact that there would be four acres of bermed wetlands on the Broad River which would invoke Clean Water Act regulations and compliance with some federal and state wetlands regulations, were there any alternatives to the proposed river diversion? 2) Would the groundwater discharge point migrate south with the channeled diversion and temporary ponding of the water? 3) With the channeled diversion and the ponding, what types of environmental effects would the isolation berm have on the Broad River aquatic habitat and surrounding natural wetlands? 4) Would the channel diversion and ponding be permanent or temporary?

Ms. Tyler then stated that the US EPA would like to know when these questions would be addressed and what the time table was for moving forward with the conceptual plan. She said that one recommendation made tonight was to sit down and ask these questions and get some answers. She suggested that such an exchange include a site visit to the proposed areas in order that all the regulatory agencies and stakeholders could come together and hammer out the specifics now missing in the conceptual plan.

Mr. Taurasi wanted to reinforce what Ms. Tyler had said about raising the level of the Broad River. He also expressed his concern about the human health risk from air exposure to EDB in the areas of the ponding. He wondered what might happen, if the berms would be washed out in the event of a hundred-year storm (which seemed to happen every two or three years around here). Mr. Taurasi said that if the concept was doable, that was great, but if it got the point where it didn't look like it could work, then it would be time to move on and find another solution.

Ms. Krueger noted that the MDPH had been involved with some of the air exposure questions. From what had been seen, there didn't appear to be an unusual public health risk. However the department was concerned about air exposure and would like to look carefully at it again.

Col. Selstrom told Ms. Tyler that he appreciated what she had said about getting together a group of people to discuss concerns and walk the site. He felt that they needed to be very deliberate and sure that everyone understood the issues. Col. Selstrom also acknowledged what had been put together in the past four or five weeks. He said that he had visited the Pentagon last week and made sure that the people there understood what was to be proposed. He agreed with Ms. Tyler that the TRET should look at the plan and stated that this was part of the TRET's purview.

Mr. LeFleur recalled that last year, about mid-April, there had been a frost event where the growers had to start irrigating. This had sparked a lot of concern about the use of EDB water. He noted that today was March 3, six weeks away from the beginning of the growing season. Mr. LeFleur stressed that the growers needed to know whether or not they should grow cranberries this year and they needed to know this fairly quickly. Whether they would be compensated by growing cranberries or by another means, the growers needed to take action either to begin growing the berries or to maintain the property for the coming year. He said that he hoped that there would be some answers within the next few weeks so that the growers could plan for the coming season.

Ms. Flynn, Falmouth Selectman, agreed with Mr. LeFleur that the issue of management of the bogs and the form of compensation were very important and time was running out. Mr. Pavetto added that he would be attending a meeting with a congressional delegation on Friday and would relay these concerns.

Agenda Item #9. General Questions, Comments and Discussion

Mr. Caruso of the Cranberry Experiment Station noted that, due to El Niño, the weather on the east coast was about a month ahead of schedule, therefore the frost season which Mr. LeFleur had mentioned was much closer than one may have thought.

Mr. Bicki asked if the military had considered an alternate design proposal dealing with a series of smaller scale remediation efforts focusing on individual beds or bogs, which could be then be stepped up to the full proposed plan. He explained that there may be individual bogs in the Quashnet or Coonamessett systems that could be brought back into production with less ecological or fisheries impacts and suggested the consideration of a step-wise progression to bring the beds back on line.

Mr. Bicki also reiterated that in order for the growers to have a marketable crop they had to demonstrate clean fruit for one year. He suggested that the clock for that year start tomorrow. He said that a systematic sampling of every bed and all water systems was needed so that a history could be created, starting from tomorrow, of no detects of EDB in the water. Putting this off for a matter of months meant postponing the start of that one year clock. Mr. Bicki stated again that the monitoring needed to start tomorrow on a bed by bed basis in order to begin to provide compensation.

Mr. Dow spoke about the proposed berm along the Coonamessett River and said that it would effectively channelize half of the stream. This could result in flooding for the people living on the other side, away from the berm. He also noted that channelizing the stream would greatly increase the peak flow. Mr. Dow recommended that serious thought go into what would occur in the event of heavy rains and flooding as well as the possible biological consequences.

Ms. Walker of Sandwich spoke about FS-28. She noted that only a portion of the plume upwelled into the Broad and Coonamassett Rivers. She wondered if a plan for remediation for the rest of the plume would be presented. Mr. Snyder replied that the remaining remediation requirements for the plume would be identified as part of the Southwest Operable Unit (SWOU). Ms. Walker asked if this would also be the case for the EDB in the Quashnet River, south of the bogs. Mr. Snyder replied that was correct.

Ms. Kiley of MA DEP told Mr. Snyder that her understanding of the EW-1 report, soon due to be submitted, was that it would evaluate that part of the plume that was not captured by the existing treatment system. She explained that she was referring to that portion of the plume that was between the existing system and Thomas B. Landers Road. Ms. Kiley said that she thought that this had been Ms. Walker's question. Mr. Snyder replied that he had thought that Ms. Walker was referring to the area north of that point. He also told Ms. Kiley that she was right that the EW-1 report would address the lobe south of EW-1. Ms. Walker said that she had been asking about the area south of EW-1. Mr. Snyder replied that the draft report to the agencies would address how the plume would likely behave south of EW-1.

Mr. Forest of Congressman Delahunt's office told the growers present that the issue of compensation was at the top of his office's radar screen. He said that there had been discussions with the Pentagon about laying the groundwork to seek authorization for compensation, if necessary. He assured the growers that these discussions would continue. Mr. Forest also said, however, that it would be desirable to see the compensation issue resolved as part of this overall package. He hoped that the group would soon come to consensus on protocols and an overall remedial action plan. Regarding compensation, some direction would soon be sought in terms of the need for authorization. He reported that his office would be meeting with representatives from the Air Force and the Pentagon in the next couple of weeks.

Ms. Caffyn stated that while she appreciated Mr. Forest's wish for a package deal, she noted that the growers were business people who had to plan ahead. She said that their lives and incomes were at stake. She felt that the proposed plan was very complex, full of issues which may or may not be resolved. What was consistent was the need for compensation for the timeframe when cranberries could not be grown and marketed. An immediate answer was needed, an answer which was not tied into anything else, such as a

protocol. She said that everyone could agree that unless the EDB were cleaned up, there could not be a marketable cranberry crop. This was simple and everyone knew that coming into the meeting. She said that there should have been answers to this tonight.

Agenda Item #10. Identify Action Items and Next Steps

Mr. McGlennon noted that the AFCEE staff would move forward with their proposed concept and would involve the TRET and other appropriate parties to address the issues raised by those at the table. He also said that answers would be sought to the question of the funding issue as quickly as possible.

Mr. McGlennon then informed the group that he had asked Ms. Valiela to track Next Steps throughout the meeting. Ms. Valiela remarked that the funding issue for 1998 was essential and should be at the top of the list. She said that the legislation for that should be drawn up now. She also said that if it made sense from a congressional point of view to look at both 1998 and 1999, then that should be done.

Ms. Valiela remarked that it should be determined whether more direction from the community was needed by the Congressional delegation regarding the funding issue (i.e. letters from the selectmen and the growers). Mr. Forest stated that he was here tonight to get a sense of the issue. He said that his office was concerned about timing in terms of getting the necessary congressional authorization. He also said that there had been a difference of interpretation between congressional offices and the Pentagon with respect to whether or not authorization was necessary. Rather than prolong the debate, the decision had been made to pursue the authorization despite the doubt as to whether or not it was necessary. Mr. Forest also commented that it had been genuinely helpful to hear tonight what the regulatory agencies, the communities, and the growers were looking for. He agreed that now was the time to draft legislation and begin the process, but did not feel sure that more calls and letters from the community were necessary. He said again that funding was a very high priority. Ms. Valiela replied that she would wait to hear on that and noted that the legislation had clearly referred only to commercial losses in 1997. She maintained that 1998 and 1999 still had to be addressed.

In terms of the conceptual plan, Ms. Valiela recommended that Mr. Snyder meet with the Conservation Commissions from both Mashpee and Falmouth, that a list of all the regulators which would affect this issue be drawn up, and that the TRET be brought in early.

Ms. Valiela agreed with Mr. Bicki that monitoring of all water sources and all bogs should begin tomorrow so that the standard of one year of non-detect could be met as soon as possible. She suggested that Mr. LeFleur define what was meant by *all* bogs so that the monitoring system could be readily established. She also noted that the issue of uptake of the vines should be pursued and investigated further.

Regarding the issue of the cranberry testing protocol, Ms. Valiela said that the next "Status of Cranberry Bogs at FS-1 and FS-28" meeting date should be set in order that the technical issues and a list of the policy issues from the effected agencies could be reviewed and discussed at that time. Because the technical protocol was expected to be delivered to the agencies on April 17, 1998, Ms. Valiela suggested that the meeting take place a couple of weeks later. After some discussion among the group, the next Cranberry meeting was scheduled for May 6, 1998 from 6:00 to 8:00 P.M.

Mr. Crombie stated that the Air Force had previously indicated that it would not have to go back to Congress. He said that if the Air Force's plans were approved, the land could be leased for compensation and he recommended that that be done so that the issue of compensation for the coming year could be put away. He stated that the notion of going back to Congress was very dangerous and had not been the intent.

Mr. Ciavattieri suggested that the sequence of meetings with the Air Force begin very early with the regulators. He acknowledged the need for the Air Force to meet with the Conservation Commissions and other organizations, but he felt that the Air Force should get their proposal to the regulators as quickly as possible so that the proposal could be properly reviewed and its merit determined.

(*Please note that during the meeting, panel members made the following additional requests for action:

- Ms. Caffyn requested that the Air Force provide maps of the FS-28 and FS-1 cranberry bog areas which would include the locations of nearby private residences.
- Ms. Caffyn requested that the Air Force include air monitoring on their list of tasks relating to the conceptual plan.
- Mr. Sherman requested that the Air Force invite the Natural Resources Conservation Service to participate in meetings and working groups relating to the conceptual plan. Ms. Valiela requested that the Army Corps of Engineers also be invited to participate.
- Ms. Caffyn requested that the TRET be charged with the study of the conceptual plan.)

Agenda Item #11. Select Spokesman to Report to the Senior Management Board and Adjourn

Ms. Valiela agreed to report to the SMB about the events of this meeting.

Col. Selstrom thanked everyone for listening and assured that group that their concerns and comments were appreciated.

Mr. McGlennon adjourned the meeting at 8:23 P.M.

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8 APRIL 1998 MEETING MINUTES

TECHNICAL MEETING ON BOG AND RIVER SEPARATION AT FS-1 & FS-28
MEETING SUMMARY
Wednesday, 8 April 1998, 10:00 A.M. - 12:45 P.M.

Attendance

Name	*Organization*	*Phone*
Tom Szymoniak	Jacobs Eng	(508) 564-5746
Greg Braun	MDPH/BEH	(508) 968-4950
Nancy Caffyn	Town of Mashpee	(508) 477-0025
Ken Reback	MA Div. Marine Fisheries	(508) 563-1779 x104
Steve Hurley	MA Div. of Fisheries & Wildlife	(508) 759-3406
Cathy Kiley	MA DEP	(508) 946-2839
Steve DiMattei	USEPA	(781) 860-4369
Bob Lim	USEPA	(617) 223-5521
Jeff LaFleur	CCCGA	(508) 295-4895
Steve Spear	USDA-NRCS	(508) 771-66476
Paul Montague	Falmouth Shellfish/Herring	(508) 457-2553
Mark Patton	Dir. Fal. Nat'l Resources	(508) 457-2536
Allan Gordon	Fal. County Commission	(508) 289-2482
Joann Muramota	Fal. Conservation Admin.	(508) 568-7611 x255
Bob Sherman	Mashapee Cons. Agent	(508) 539-1400 x538
Bob Whritenour	Exec. Sec. of Town of Mashapee	(509) 539-1400 x 510
Joe Costa	Buzzard Bay Project, MCZM	(508) 291-3625
Brain Handy	Handy Cranberry Trust	(508) 564-4370
Peter Boyer	Town Admin., Falmouth	(508) 548-7611
Jim Snyder	AFCEE	(508) 968-4670
Bud Hoda	AFCEE	(508) 968-4670 x 4918
James Lyon Lt Col	AFCEE/ERD	(210) 536-5291
William Chaston	Cranberry Grower	(508) 540-1424
Daniel H. Auguta	Grower	(508) 548-6868
Marty Aker	IRP	(508) 968-4670 x4971
Tom Camberari	Cape Cod Commision/SAP	(508) 362-3828
Ray L. Cottengaim	IRP	(508) 968-4670 x4944
Jim Plunkett	Envir. Technology Cater	(508) 563-3648
Joan Miles	EPA, ORC	(617) 565-3699
Dave Hill	Bregmar/ARNG	(508) 968-5809
Emily Sperling	CCCGA	(508) 295-4996 x12
Marcel Boelitz	DEP	(508) 946-2969
Dave Pincumbe	EPA-OEP	(617) 565-4429
Matt Schweisberg	EPA-OEP	(617) 565-4431
Len Pinaud	MA DEP	(508) 946-2871

To-Do List

WHAT	*BY WHOM*	*TO WHOM*	*BY WHEN*
Form and Convene a Technical Review Group	IRP	See Below	April and forward
Meet with Town, State and Federal Officials as necessary	IRP	See Below	April and forward

The following interests, concerns, and opportunities were identified by participants at the meeting. The meeting was structured so that the Air Force presented its concept(s)for moving forward, each key stakeholder group had an opportunity to comment, and the meeting concluded with general discussion and comment.

INTERESTS & CONCERNS EXPRESSED BY TOWN OF MASHPEE

- **Herring and trout habitat.** Would like to see fisheries people involved to do a real habitat demonstration project in association with this to achieve not merely a "minimum impact" project, but one that might provide real environmental gain.

- **Long-term remedial solutions for the contamination**. Cranberry agriculture is important to the town. In addition, there must be a duel strategy for clean-up. The town is willing to move forward on this as long as the town is assured that long-term there is a remedial clean-up of the contamination as well. This proposal should not serve as a replacement for long-term remediation. The town is looking to active treatment rather than monitored natural attenuation. This active approach will help address concerns about air quality among others.

- **Property interest.** The Town is aware of current legislation where the military would lease property from the town for two years as part of the short-term compensation arrangement. The town is not opposed but would like to get moving on this as soon as possible so that this issue does not cause delay in the future.

- **Schedule.** Want to move forward so that the cranberry growers have one year of clean water under their belt so that the cranberries are marketable again

- **Bog maintenance.** In the interim, as this proposal is developed and implemented, the town wants to see on-going maintenance of the bogs.. Brian Handy has spent a great

deal of money and effort undertaking major planting of cranberry bogs. Want to see plan in place to protect Mr. Handy's and the Town's investment. The Town is also concerned about the long-term maintenance of the berms and its cost to the Town.

- **Wetland mitigation.** If any of the berms extend past cranberry bogs into wetlands, there will likely be the need for replication of wetlands elsewhere.

- **Leasing.** The IRP should work with Joel Lerner of EOEA because of the leasing that would be required of conservation land.

INTERESTS & CONCERNS EXPRESSED BY TOWN OF FALMOUTH

- **Schedule.** A whole series of events must be sequenced including working around the cranberry season and fisheries seasons. The Town needs to have a detailed schedule to know what will happen when. November to March may be the best time for work in regards to fisheries because of the differing trout and herring spawning seasons.

- **Bog maintenance**. Falmouth is trying to work out questions of maintenance with its relationship with Brian Handy in terms of a lease at the Federal level that will evolve over the next few months.

- **Long-term benefits.** This concept may produce many benefits including protecting ecological areas by separating them from active cranberry bogs. In fact, this concept may be applicable in other areas not affected by contamination. The town would like to work with others to identify other sources of funding for such efforts elsewhere.

- **Dissolved oxygen of effluent from treatment systems.** The Town wants to ensure the discharged effluent will meet dissolved oxygen standards.

- **Ecological impacts of treatment effluent.** A number of factors will have to be considered in terms of the discharge from treatment systems including flow volume, turbidity, erosive power, and turbulence. A variety of discharge points for the effluent ought to be considered, such as Coonamessett Pond, and up and/or down stream, in order to minimize ecological impacts and perhaps mitigate against dry weather on the herring run, for instance.

- **Effects of water retention on hydrology.** The Town is concerned about any impacts ponding or other water retention may have on the hydrology in the area. The Town has already asked the Cape Cod Commission to undertake an outside review of the modeling efforts.

- **Effects on vernal pools and natural wetlands**. The Town would be concerned about disturbance of the vernal pool or other natural wetlands, particularly on the west side of the bogs.

- **Effects on flood storage**.

- **Effects on abutters.** There are some residences close to the area in question. The construction and other impacts on them should be considered. It would be important to guarantee safety and security for these residents. Security might include postings, fences, and other protective measures for people and pets.

- **Air quality.** If EDB volatilizes, the Town is concerned about its impacts on air quality and human and ecological health.

- **Alternatives analysis.** Proposals should be compared to a set of alternatives.

- **Potential mitigation**. Instead of a simple holding pond, a vegetated wetland could be created. The vernal pool may rest at an elevation above the bogs so this should be reviewed. It may be possible to simplify/improve the herring run. It may be possible to locate discharge points to enhance or even create habitat.

- **General concerns**. Efficacy, the time scale for clean-up, the adequacy of the groundwater model, and the use and leasing of Town lands.

INTERESTS & CONCERNS EXPRESSED BY CRANBERRY GROWERS

- **Begin to address concerns** . Growers noted that they appreciate that the Air Force is working with the towns and the growers to begin to address this issue.

- **Potential win-win**. With mitigation, the concept has the potential to achieve environmental gains and gains for the growers if all parties work closely together. Growers would like everyone to walk away with a plan that will help everyone, and recognizes that this kind of plan will take compromises on everyone's part.

- **Design review group**. Growers support a small group to work with the Air Force to address concerns and review ideas.

- **Maintenance.** Maintenance is a concern that needs to be addressed in the short and longer term. For this year, growers are very anxious to know how to proceed so that do not have to raise a crop that will have to be destroyed at the end of the year.

- **Communication.** The growers would like to hear updates and information directly from Air Force from time to time.

INTERESTS & CONCERNS EXPRESSED BY EPA

- **An enforceable schedule** is in place for investigation of the contamination at FS-28 and FS-1 in addition to this proposal. The FS-1 draft ROD is expected in April of 1999. The draft ROD for FS-28/the Southwest Operable Unit (SWOU) is expected in August of 1999.

  - **Alternatives analysis.** In order to comply with water quality standards regulations, Air Force will need to provide an alternatives analysis, including a no action alternative and using other wells to increase extraction and treatment. Alternatives might be considered in terms of their benefits differential in time -- between moving forward with berm work now versus construction and operation of an active remedial system later without the berm work.

  - **Plume Characterization.** There are a great deal of unknowns regarding this plume -- where it is coming up for instance. The potential effects of any options on the plumes must be considered.

  - **Impacts on aquatic habitat.** The costs and benefits of habitat alteration need to be considered. Air Force will need to do a very thorough characterization of all aquatic habitat that could be effected by the alternatives, including upstream and downstream impacts, with a focus on fisheries and any rare species.

  - **Compensation.** Compensation would have to be determined on what would be called unavoidable adverse impacts.

  - **Meeting water quality standards.** A determination must be made on whether the Cape Cod Cranberry Growers'/Ocean Spray water standard of no detects of EDB for one year are achievable by the proposed options.

  - **The long-term.** The permanence of these options and their resulting changes must be considered. How long would they be in existence? What would be done with the "holding" bogs when they were done serving their purpose as part of the clean-up system?

- **Contingencies.** It seems that the EDB upwelling needs to be further characterized. If EDB is found in the cranberry bogs despite these efforts, what then?

INTERESTS & CONCERNS EXPRESSED BY THE COMMONWEALTH

- **Maintenance.** Maintenance is a concern that needs to be addressed in the short and long run.

  - **Certified vernal pools and natural wetlands.** It will be very important for any concept that goes forward to adhere to a set of principles, including avoiding adverse impacts to existing natural wetlands.

  - **Herring runs and Brook Trout habitat.** There is general concern about habitat as well as a specific concern about the bog in the northeast corner of the FS-1 area. Due to significant groundwater flow there, there is important trout habitat. Impacts of stream flow and seasonal water levels must be addressed above, at, and below the intended area of construction/modification.

  - **Treated water discharge.** The state is concerned about dissolved oxygen in the effluent. Coonamessett is considered a Class B river. Discharge to Coonamessett Pond might also be considered. Any treatment must consider back-up systems to ensure that if there is carbon breakthrough or system failure, no contaminated water will be discharged.

  - **Ponding impacts.** Ponding raises concerns about air exposures as well as impacts on hydrology of the contamination.

  - **Construction impacts.** Best management practices (BMP) must be used under construction to address concerns about silts, turbidity, and so on. This will require more than simply asking for BMP, but providing the necessary daily oversight and authority to stop work if the work is causing adverse impacts.

  - **Active treatment.** There needs to be more active treatment than just UV breakdown: that is, carbon treatment of the EDB-contaminated surface water.

  - **Air quality.**

  - **Flood storage.** Any plan needs to address flood conditions such as a 100 year storm event.

- **Regulatory framework.** This project could be done under a "limited project status" of the Wetlands Protection Act. A "no practicable alternative" must be demonstrated. A "Notice of Intent" would need to be filled out for the local Conservation Commissions.

- **Impacts on rare species.** In the FS-1 area, rare spotted turtles are of concern.

- **Information on FS-1.** There is less data on upwelling in the FS-1 area than the Coonamessett. This information needs to be obtained as soon as possible. There are also more concerns about this area because there are more resident fisheries than in the Coonamessett.

- **Potential for the concept.** The CZM believes that there is value to the concepts proposed so far, with opportunity for improvement, but also concerns to be worked out. It is in the long-term interest of the growers and the fisheries to separate the river from the bogs. The Buzzards Bay Project of the Massachusetts Coastal Zone Management program has been working to address fisheries concerns and run-off from bogs for some time. This concept is in synch with earlier CZM proposals. This concept, if successful, might be a model for addressing cranberry/wetlands/fisheries issues elsewhere.

- **Hydrological Balance**. There is concern about how the concepts and any treatment may affect surface and groundwater recharge above and below the area under consideration. Will there be fish passage problems? There may be a chance to address current concerns at Johns Pond regarding a blocked outlet, perhaps through deepening of a channel and installation of a fish ladder.

- **Mitigation.** There are opportunities for potential mitigation and environmental gain, perhaps best beginning with a demonstration project. For instance, it might be possible to develop riparian zones along the berms, providing a buffer between the stream and the berm. However, the state has limited resources to fully support the complex engineering of natural systems that will be required to be successful. Thus, the Air Force should ensure that they have adequate and capable environmental engineers specialized in improving stream habitat and other potential mitigation measures.

- **Long-term Outcome.** What would happen to the areas bermed off for upwelling and treatment in the longer-term? Would they become cranberry bogs again at some later point or be left as vegetated wetlands? Who would decide this question? The bogs might be separated from the rivers in such a way that a range of options remains open for the future.

- **Construction Schedule.** Since the herring run in the spring and the trout spawn in the fall, this will place significant constraints on the construction schedule.

- **Fish Health.** Some studies suggest that concentrations of EDB from 1 to 18 ppb cause cancer in fish. Given the known papillomas in bullheads, there is on-going concern about cancer risk to fish. The state would like to see a more thorough literature review of EDB and risk to fish health done by AFCEE.

- **Loss of Cranberry Acreage.** There is some concern with concepts that would involve work in the middle of the bogs. Working on the edge of the bogs would minimize adverse impacts to the cranberry bogs and their operations.

INTERESTS & CONCERNS EXPRESSED IN DISCUSSION

- **Standards of Clean-Up.** The parties should ensure that any concept can meet the criteria for clean water (non-detect for EDB for one year) for cranberry bogs as established by Ocean Spray. Ocean Spray should perhaps be included in future discussions.

- **Cranberry Bog Water Supply.** Bogs will continue to need clean sources of water for irrigation and flooding, as well as appropriate drainage. The concept may require modification or redesign of existing cranberry water supplies. Would it be possible to site a irrigation pond upstream, such as Pond 14 at FS-28, to provide clean water to the bogs? It was noted that this was unlikely because of limited space in this area.

- **USDA Natural Resource Conservation Service.** The NRCS should be directly and closely involved in on-going review of this effort given their knowledge of the cranberry industry and best management practices.

- **Contingencies.** If EDB were to continue down the river below the berms, would it make sense to separate all river water from the bogs?

- **Monitoring** Sampling and Analysis Plans (SAPs) must include monitoring for flooding, low flows, backflowing, and up and down stream.

- **Permitting.** A range of permitting issues must be addressed. Is there sufficient information to file permits with the Commonwealth, the US EPA and the US Army Corp. as soon as possible? If not, what information is missing and must be gathered? Would this project be eligible for any kind of agricultural exemption?

- **Superfund Linkage.** There may be some issues from Superfund that may affect this concept, and vice versa. Thus, work on this effort and clean-up at MMR should be closely coordinated on an on-going basis.

- **"Showstoppers".** The participants noted that while they have identified numerous concerns that must be addressed, the group has not at this time identified any "showstoppers" that would strongly suggest that the Air Force should not proceed with further development of the concept. The participants at the meeting were amenable to establishing a design review team to help further advance, define, investigate, and improve the Air Force's concept(s).

NEXT STEPS

- **Form and Convene a Technical Review Group.** The Air Force will convene a technical group to address technical and permitting issues. This technical group should include representatives from the following organizations.

  - USDA NRCS
  - Buzzards Bay Project - CZM
  - EPA -- both water/wetlands and Superfund
  - DEP -- both water/wetlands and Superfund
  - MA Fisheries and Wildlife
  - MA Division of Marine Fisheries
  - Growers, Cape Cod Cranberry Growers, and/or Ocean Spray
  - Mashpee and Falmouth Conservation Commissions (or other representatives from the towns, perhaps including but not limited to Foothills Engineering as the technical consultant for the SMB selectmen)
  - IRP/AFCEE
  - Army Corps of Engineers.

  The permitting issue should be the first order of business.

- **Meet with Town, State and Federal Officials, as necessary.** The Air Force should continue to work closely with the growers, towns (town management and selectmen), state elected officials, and congressional delegations to address issues of compensation, leasing of bogs, and maintenance issues. These three issues, generally, would not be addressed by the technical review group outlined above.

(4)

28 JUNE 1998 MEETING MINUTES

TECHNICAL MEETING ON BOG AND RIVER SEPARATION AT FS-1 & FS-28
MEETING SUMMARY

Thursday, 28 June 1998, 2:00 A.M. - 4:30 P.M.

Attendance

Name	*Organization*	*Phone*
Marty Aker	IRP	(508) 968-4670 x4971
Nancy Balkus	AFCEE	(210) 536-5248 or (508) 968-4670 x4676
Marcel Boelitz	DEP	(508) 946-2969
Tom Camberari	Cape Cod Commision/SAP	(508) 362-3828 water@cape.com
Ray L. Cottengaim	IRP	(508) 968-4670 x4944
Allan Gordon	Fal. Consv. Commission	(508) 289-2482 agordan@whoi.edu
Dave Hill	Bregmar/ARNG	(508) 968-5809
Doug Hodge	Jacobs	(508) 564-5746
Steve Hurley	MA Fisheries & Wildlife	(508) 759-3406
Cathy Kiley	MA DEP	(508) 946-2839
Liz Kouloheras	MA-DEP Wetlands	(508) 946-2810
Bob Lim	USEPA	(617) 223-5521
Joan Miles	EPA, ORC	(617) 565-3699
Michael Minior	IRP	(508) 968-4672
Joanne Muramota	Fal. Conservation Admin.	(508) 568-7611 x255 jmuramoto@aol.com
Mark Patton	Dir. Fal. Nat'l Resources	(508) 457-2536 VRVE53A@prodigy.com
Len Pinaud	MA DEP	(508) 946-2871
Donald Schall	Jacobs/ENSR	(508) 888-3900 dschall@ensr.com
Matt Schweisberg	EPA-OEP	(617) 565-4431
Bob Sherman	Mashapee Cons. Agent	(508) 539-1400 x538 silabob@aol.com
Tom Szymoniak	Jacobs Eng	(508) 564-5746
Bruce Tripp	Fal. Consv. Commission	(508) 289-2900 btripp@whoi.edu
Dick Willey	USEPA	(617) 573-9639

Handouts List

Title	*Source*	*Date*
Bog Separation, Coonamessett and Quashnet Rivers	Jacobs	6/25/98
Agenda	CBI	6/25/98

To-Do List

WHAT	*BY WHOM*	*TO WHOM*	*BY WHEN*
Determine Overall Regulatory Framework for Proceeding	IRP, EPA, DEP		Approximately 1 August
Meet weekly as part of the IRP Thursday morning Technical Group	IRP/Jacobs	DEP, EPA, Cons. Comms.	Every Thursday, July
Conduct a Site Tour of FS-1 and FS-28	All parties		Late summer/early fall
Meet to discuss specific permitting needs	IRP, EPA, DEP wetlands staff		After regulatory framework is determined

Introductions and Agenda Review

The meeting attendees agreed that today's agenda will include a presentation by IRP/Jacobs, a discussion of the issues, and developing next steps for moving forward in a coordinated and informed manner.:

Bog/River Separation Current Actions at the Coonamessett and Quashnet Rivers

A review of the Bog Separation, Coonamessett and Quashnet Rivers document was provided by Jacobs Engineering. Jacobs presented information with questions asked as the presentation moved forward.

- Field Activities at FS-1 (Quashnet River) -- Most of the areas in the bogs have 30-40 feet of peat. It has been discovered, however, that where the layer of peat is thin (approximately 14 feet), EDB upwells into the bog itself. Jacobs is currently looking at cross sections of the bog to detect further contaminants and their 'path' (a diagram of a cross section was handed out). So far, the data sheets seem to fit with earlier groundwater monitoring. Still more work needs to be done.

- Surface Water Sampling - Some contamination has been detected at the outlet of Pond 14 (located at the confluence of Broad River and Coonamessett River) and into Flax Pond. By having the upper bogs flooded, it is possible to have the lower bogs show 'non-detect'. Ultimately, however, it is not a solution to keep flooding the bogs. Sampling of the Augusta Bog (after flooding it with spring and river water) has indicated no contamination. One dilemma is how to provide clean water for flooding. Dry harvesting would take 3-4 years of training the vines to be effective and would still require water for irrigation and winter protection. Jacobs has copies of the surface water samplings upon request.

<u>Bog/River Separation Current Alternatives at the Coonamessett River</u>

Please note that all the alternatives below assume that EW-1 is in operation.

Coonamessett Alternative A: No Action (with controls)
This alternative would include buying out land, crop, or long-term lease. The idea is to maintain marketability of the cranberry crop through some use of irrigation and herbicides. There would be no separation of bogs from the river. Personal protective equipment would be provided.

Comments and questions are noted below.

- There has already been one year of this "no action".
- The Falmouth Conservation Commission is more concerned about pesticide use on cranberry bogs generally. Other contamination of the bogs is of secondary importance to them. They would most likely prefer alternative D (especially if cranberry bogs continue to exist) or A.
- Only two bogs are currently dry harvested, most of the bogs are wet harvested. Where would the water come from if alternatives B, C, or D are used?
- The town lease for the bogs expires in five years - then what happens? The options are: a) return bogs to natural wetlands, either through an active or passive process; b) alternative farming; c) keep on growing cranberries. The current discussion regarding alternatives assumes that the town will continue with cranberry growing.
- The town's long-term goals are up in the air. The short-term goal is to maintain cranberry bogs. Regarding the long-term goals, they are dependent on whether or not the contamination can be cleaned up and when.
- Since the cranberry bogs are around 200 years old, cranberry growing is part of the local culture. It is difficult to imagine the town would decide not to continue growing cranberries.
- The natural stream system has been adversely affected by cranberry agriculture. Cranberries and fisheries are competing resources. It's best for both to separate the river and the bogs.
- There are two main species of fish - the River Herring and the Brook Trout. For spawning, brook trout seek upwelling groundwater in the rivers in the fall (October). Herring spawn most often in ponds in the spring.

Coonamessett Alternative B: Channel Realignment

A goal for this alternative is to isolate upwellings and to produce clean water so as to have Pond 14 show non-detect. One of the goals of this alternative is to control the EDB that is surfacing currently in two places - to keep it out of the river (alternative B). As well, the fish pathway will not go through the bogs thus separating the conflicting uses of fisheries and agriculture. The flow of the water from the bogs to the river will be controlled by keeping it in a "ponding" area for 14 days. There would be no active treatment of the contamination. No changes would be made to the hydraulics and there would be no effect to the vernal pool. Bogs in areas 1 and 3 on the 3rd diagram of the handout would be converted to wetlands. Contamination would be reduced by ten fold to .01. The entire river system consists of 60 acres which are now not in use. With this alternative, 51 acres could be back in production (9 acres would be lost).

Comments and questions are noted below.

- Who owns the bogs? The bogs that are privately owned are Augusta, Adams, Lasalle, and Chaston. The others (including Baptiste, Thompson) are owned by the town.
- The question came up if the separation of the bogs/river are part of the town goals. The town representative responded by stating that this depends on the methods used.
- What happens to the EDB in this case? A small portion of the EDB would volatilize (the air levels of this would be very low and would be monitored). The rest would leave the bog and move downstream, eventually reaching non-detect further down.

Coonamessett Alternative C: Realignment with Treatment - comments:

The goal of this alternative is to capture the plume as it is upwelling. This alternative would include the same action as B with the addition of an active treatment using shallow well points. It would include pumping of 1,500 to 2,200 GPM (gallons per minute) to keep up (that equals approximately 3.5 million gallons per day). It would take 4 carbon trains to treat this water The wells are easy and low-cost to install. They would be installed in the bogs in the basins. The well field covers small areas.

Comments and questions are noted below.

- Why does the active pumping only take place in one area of the basin? Why not treat all the water in the basin? The active pumping takes place where the upwelling is occurring. As it is, this would be significant pumping (3.5 million gallons per day). If we were to treat the entire water in the basin, this would be very inefficient and expensive with little improvement over this scenario.

Coonamessett Alternative D: Separate All Bogs

This alternative would include the entire river system.

<u>Permitting Issues</u>

The Conservation Commissions asked for IRP and the environmental agencies to speak to the permitting issues. The IRP, EPA, and DEP noted that the regulatory authority under which this project will fall has not yet been determined. Consequently, the participants noted two scenarios: one in which the project proceeds under CERCLA, the superfund law, and one where it proceeds under standard permitting procedures and requirements.

The participants noted the following permits/regulations if the action were to proceed not under CERCLA.

- Notice of Intent and Local Wetlands By-Laws
- Wetlands Permit (MA)
- Chapter 91 (MA)
- 401 and CZM Water Quality (MA)
- MEPA Filing because certain threshhold would likely be exceeded (MA)
- 404 Clean Water Act (Federal)

The participants noted the following if the action were to proceed under CERCLA.

- No formal filings for various permits would be necessary.
- However, action would have to meet the substantive requirements of the various rules and regulations.
- Air Force would work directly with the EPA rather than through the Corps under the 404 Clean Water Permit process.
- IRP would need to continue to consult and work with local towns.

EPA noted that in order to evaluate the alternatives, a project purpose must be determined. If the project purpose is to protect against unacceptable risk under CERCLA-- which at this time would be cranberry workers -- then the alternatives would have to be measured against how well they end, reduce, or mitigate against this risk. If the project purpose is to provide clean water for one year and more to ensure the marketability of the crop, than this would be a different matter and require a different kind of evaluation.

Communication Concerns and Next Steps

Both town representatives and environmental agencies expressed concern that they have not been kept informed of on-going progress on this action. In order to improve communication in the future, the following next steps were discussed and agreed upon.

- The overall regulatory framework guiding this action must be determined. EPA, DEP, and Air Force will need to work out whether the action will proceed as a CERCLA or non-CERCLA action. In order to determine this, the following is required.

  - An AFCEE response to EPA's request for clarification;

- EW-1 Performance Report Response to Comments Letter including revised risk calculations for cranberry workers for FS-28 (expected on or around 27 June);
- FS-1 Surface Water risk assessment letter report, including revised risk calculations for cranberry works at FS-1 (date to be deteminred); and,
- FS-28 monitoring plan, discussion of how and where to collect surface water samples (expected on or around 10 July).

The parties expect that on or around **1 August** a determination in regards to regulatory authority and framework will be made.

- Simultaneous with the above effort, the analysis and refinement of alternatives will proceed. In order to ensure open and clear communication, an explicit time on **each week's Technical Meeting** agenda will be set aside for discussion of the bog/river separation project. A representation from the Mashpee and Falmouth Conservation Commissioners (including but not limited to the Cape Cod Commission), will be invited to attend by IRP. Fisheries staff will attend if available and if there are pertinent topics (Fisheries noted again their recommendation that IRP hire a wetlands/fisheries expert to ensure fisheries are adequately protected under any action that proceeds). IRP will send this agenda out ahead of time via e-mail and inform the parties of the time and place for the meeting as well as the agenda topics. If no meeting is necessary that week, IRP will inform the parties of this lack of need for a meeting.

- At a later point, a **field trip** to FS-28 and FS-1 for all parties would be helpful to give parties a "concrete" sense of the area and proposed alternatives.

- Once the overall regulatory framework question is answered, DEP, EPA, and IRP consultants will sit down to discuss **specific permit needs and requirements** for proceeding.

Adjournment

The parties agreed not to establish a next meeting time for this full group at this time. Work will progress in the short-term as described above with this larger group reconvened as necessary. The CBI facilitator noted that any party can contact CBI if they have concerns or worries about communication.

The meeting was adjourned at 4:30 PM.

(5)

9 SEPTEMBER 1998 AGENDA, MEETING MINUTES, PRESENTATION HANDOUT

FS-28 Coonamessett River Stakeholder Summit
September 9, 1998
Quality Inn, Falmouth
9 am – 3 pm

Purpose: For the Air Force to present information concerning the potential alternatives for cranberry bog/river separation, and to provide an opportunity for stakeholders to ask questions or raise concerns.

Objective: To reach a consensus agreement on a preferred alternative at the 16 Sep 98 meeting.

9:00 – 9:15	Introductions
9:15 – 9:30	Background Information/Schedule
9:30 – 9:50	Review of Investigation Data - Surface Water - Air Monitoring - Shallow Groundwater (Drive Points) - Groundwater - Dissolved Oxygen and Temperature Trends
9:50 – 10:00	Conceptual Site Model
10:00 – 10:20	Response Actions - Extraction Well #1 (EW-1) -- Capture and Influent -- Mass Removal -- Modeling - Previous Pump and Treat Scenarios - Water and Discharge Measurements - Surface Water Trends (Flooding) - Groundwater Trends
10:20 – 10:30	BREAK
10:30 – 10:35	No Action Alternative
10:35 – 10:45	Alternative A – EW-1 + Buy Out
10:45 – 10:55	Alternative B – EW-1 + Channel Realignment
10:55 – 11:05	Alternative C – EW-1 + Channel Realignment and Treatment
11:05 – 11:15	Alternative D – EW-1 + Separate All Bogs
11:15 – 12:00	Alternative E – EW-1 + Phased Approach
12:00 – 12:45	LUNCH BREAK
12:45 – 3:00	Question and Answer Discussion - Clarify alternatives - Discuss advantages and disadvantages of each alternative - Identify Roadblocks to implementation of alternatives - Discuss preferences

FINAL MEETING: September 16, 1998, Otis Golf Course, 1-4 pm, Consensus Decision Meeting

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FS-28 Coonamessett River Stakeholder Summit
Quality Inn, Falmouth
September 9, 1998
9:00 A.M. – 3:00 P.M.

Meeting Minutes

Attendee:	Organization:	Telephone:	E-mail:
Nancy Balkus	AFCEE/MMR	508-968-4670, ext. 4676	nancy.balkus@hqafcee.brooks.af.mil
Tom Szymoniak	Jacobs Engineering	508-564-5746	tom.szymoniak@jacobs.com
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Joan Miles	US EPA	617-565-3699	Miles.joan@epamail.epa.gov
Michael Jasinski	US EPA	617-573-5786	Jasinksi.mike@epamail.epa.gov
Cathy Kiley	MA DEP	508-946-2839	Cathy.kiley@state.ma.us
Steve Spear	USDA NRCS	508-771-6476	
Greg Braun	MA DPH	508-968-4950	
Mary Sanderson	US EPA	617-573-5711	
Joanne Muramoto	Falmouth Conservation Commission	508-548-7611	
Richard Koehler	Resident	508-540-0332	Rkoehler@capecod.com
Brian McDermott	Resident		
Gail MacRae	Resident	508-540-1202	
Len Pinaud	MA DEP	508-946-2871	
Liz Koulheras	MA DEP	508-946-2810	
Dave Hill	MA ARNG	508-968-5809	Djill@capecod.com
Jeff Burt	Cape Cod Times	508-540-0351	
Mark Patton	Falmouth Division of Natural Resources	508-457-2536	
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Virginia Valiela	Town of Falmouth	508-548-7611	
Heather Harper	Town of Falmouth	508-548-7611	
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Jan Selman	Pinecrest Beach Assoc.	508-540-4586	Capeartist@aol.com
Una Shea	Pinecrest Beach Assoc.	508-540-0351	
Alan Gordon	Falmouth Conservation Commission	508-548-7611	
Mike Brodski	Resident		

Facilitator:	**Organization:**	**Telephone:**	**E-mail:**
Pat Field	CBI	617-492-1414	

Agenda Item 1. Introductions:

Mr. Pat Field of Consensus Building Institute (CBI) convened the meeting at 9:10 A.M. He stated that the purpose of the meeting was for the Air Force to present information on the potential alternatives. He then asked the attendees to introduce themselves. Mr. Field reviewed the agenda and the groundrules. He introduced Ms. Nancy Balkus from the Air Force Center for Environmental Excellence (AFCEE).

Agenda Item 2. Background Information/Schedule:

Ms. Balkus stated that she was brought to the Massachusetts Military Reservation (MMR) program to work on the cranberry issues. She was specifically asked to work on Fuel Spill (FS)-1 and FS-28 and determine what needed to be done with the cranberry bogs and the ethylene dibromide (EDB) plumes. She stated that the first task she was given was to identify the stakeholders involved. She recognized the attendees as being the stakeholders. Ms. Balkus stated that her second task was to identify the issues and concerns that have been raised in the past and develop a plan to address them. Her third task was to pull all that information together into a plan or approach that was acceptable to everyone involved.

Ms. Balkus introduced various other "key players" in this process: Mr. Tom Szymoniak of Jacobs Engineering Group, and Mr. Don Schall. She also thanked Mr. Pat Field, Ms. Sarah Corner, Mr. Mark Escobar, and everyone else involved in this activity for their participation.

Ms. Balkus stated that the purpose of the summit was to present the potential alternatives being considered for the EDB response plan and to provide an opportunity for the stakeholders to have input into the process and make recommendations. She then described the goals of the Stakeholder summit. Ms. Balkus stated that one goal was to determine which alternative will best resolve the EDB problem and meet the community's needs. The second goal was to reach consensus on a preferred alternative at the September 16, 1998 meeting.

Ms. Balkus displayed a slide that listed the involved stakeholders (See attachment #1, which includes all slides in this presentation). She then summarized the issues and concerns of the Town of Falmouth, the Commonwealth of Massachusetts, the United States Environmental Protection Agency (US EPA), the Cranberry Growers and the MMR.

Mr. Brian McDermott, a Falmouth resident, asked if the MMR wanted to implement an action to return the bogs to production by the year 2000, or be out of the cranberry business by the year 2000. Ms. Balkus replied that the MMR wanted to return the bogs to normal production by the year 2000.

Ms. Balkus commented that no one stakeholder outweighed any other stakeholder. The wetlands impacts, the community impacts, the fisheries impacts, the cranberry industry impacts, the time factor, the cost, and risk needed to be combined and considered. Ms. Balkus stated in regard to next steps, that there were three options. The first option was to ignore this issue and hope it went away, the second option was to gather more information, evaluate new ideas and try to develop a better solution, and the third option was to reach a compromise on one of the proposed alternatives, and implement it as soon as possible. She

commented that hopefully by the end of the day an option somewhere in between option two and option three would be reached.

Ms. Balkus listed the past actions that had been taken. She reported that private well sampling and bottled water distribution has been provided. Private wells have been connected to public water supply in many areas, and wellhead treatment and protection to the Coonamessett Supply well have also been provided. Ms. Balkus reported that an extraction well (EW-1) has been installed at FS-28 as an interim action and was collecting the majority of the plume. She stated that based on the current draw into EW-1, the model estimated that the FS-28 plume would be clean in five to seven years. Ms. Balkus stated that alternate irrigation supplies have also been provided to the growers.

Ms. Balkus briefly described the on-going efforts for FS-28. She reported that a negative easement was currently being negotiated with the town representatives and the growers. She stated that funds are expected to be obligated by September 30, 1998, and payments will be dispersed between October and December 1998 and October and December 1999. She noted that this would compensate the growers for the crops they have been asked not to grow, while a plan was being implemented to resolve the EDB issue.

Ms. Balkus stated that a Technical Working Group has been organized to work on the cranberry testing protocol. The Technical Working Group developed a method to test the cranberries that meets the Food and Drug Administration Testing for food safety. Ms. Balkus stated that a test was scheduled for mid-September 1998. This sampling would be done to determine if the cranberries on the Flax Pond Bogs were marketable and to determine how best to dispose of the cranberries from the other bogs. Ms. Balkus reported that surface water sampling had been conducted for over a year in many locations. Samples were collected on a monthly basis. Ms. Balkus noted that there was an on-going Remedial Investigation (RI) under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or the Superfund process. She explained that this was important because the EDB response plan did not replace the RI. Ms. Balkus stated that the responsibility of the RI under the CERCLA process was to determine the final remedy to clean up the site and to close it out. She noted that today there would be discussion about a two-fold response plan to bring the bogs back into production while ensuring minimal risk to the cranberry workers and recreational users of that surface water. Ms. Balkus stated that the RI would address whether there was a risk to any of the users or potential receptors from groundwater, surface water, or air, and determine a remedy.

Ms. Balkus stated that there were two Kansas State University (KSU) studies being conducted to determine whether EDB can get into the cranberry fruit. She explained that the first study would determine whether EDB could penetrate the skin of the cranberry and into the fruit. The second study will determine whether the vines/roots of the cranberry plants uptake EDB. She stated that the first KSU study was estimated to be complete by January 1999 and the preliminary results from the second study were estimated to be complete by November/December 2000.

Ms. Balkus stated that the bog/river diversion concept would also be discussed today. She then reviewed the FS-28 timeline. She noted that every month surface water samples would be taken at the inlet and outlet of each bog on the Coonamessett River system. Ms. Balkus stated that the RI report would be submitted to the regulatory agencies by the end of October 1998. She stated that the United States Congress has passed authorization for the Air Force to provide compensation to the growers and the towns for a period of two years.

Ms. Balkus stated that in September a decision would hopefully be reached regarding whether an action needed to be implemented, and if so, what the best action would be. Engineering of the solution would begin in October 1999 with construction to begin in November 1999, and completed by March 1999. Ms.

Balkus noted that the solution would need to be implemented prior to the end of the compensation time-frame, to ensure that the growers would not be kept out of their industry any longer than necessary. She also noted that construction would be done during the least intrusive time of year as possible.

Mr. McDermott asked how much money was being spent on the bog diversion. Ms. Balkus replied that cost was dependent on which alternative was agreed upon. Mr. McDermott then asked which alternative was the most expensive. Mr. Field stated that during the explanation of the alternatives, implementation cost and time would be discussed.

Ms. Balkus reiterated that an attempt would be made to reach a decision by September 16, 1998.

Agenda Item 3. Review of Investigative Data:

Mr. Szymoniak stated that he would provide an update of the data collected over the last year. He then asked what was the highest concentration of EDB? Ms. Kiley replied the highest concentration was 0.61. Mr. Szymoniak asked when that sample was taken. Ms. Kiley replied that it was taken in June. Mr. Szymoniak clarified that sampling was done in April. He stated that three different types of sampling were done on the Coonamessett River. He displayed a map of the Coonamessett River Bogs. He stated that samples were being collected at the inflow and outflow. Mr. Szymoniak reported that ecological sampling was being done for the Southwest Operable Unit (SWOU) RI, and the highest levels were found in the Baptiste Bog. He stated that routine sampling for risk management started almost a year ago. He noted that twelve stations on the river were being sampled on a bi-weekly basis. Mr. Szymoniak also stated that there was a combination of twenty-five sampling locations. Those locations were being sampled on a monthly basis for the purpose of managing human health risk and exposure, and developing a data base of which bogs were showing contamination and which bogs were not. Mr. Szymoniak stated that the data indicated that the contamination remained in the river. He pointed to the location at which the contamination wanted to up-well. Mr. Szymoniak explained that the EDB would up-well into the river and then flow downriver. He noted the bogs that were separated from the river have remained non-detect, with the exception of the Chaston Bog.

Surface Water:

Mr. Szymoniak then displayed a map of the sampling locations of the Chaston Bogs, the West Thompson Bog and the East Thompson Bog. He stated that the data indicated that the EDB did not want to get into the bogs that were disconnected from the river. He reported that the West Thompson bog remained non-detect. He added that both the inflow and outflow of those bogs continued to be sampled.

Mr. Szymoniak reported that there were still detectable concentrations coming out of Pond 14, and a reduction in concentrations from the inflow and outflow were not being seen. He stated that as the remedial alternatives were explained it would become apparent that trying to get the concentrations in Pond 14 down to a non-detectable level played very heavily in how the alternatives were developed. Mr. Szymoniak reported that the lower bog continued to be non-detect. He stated that there were trace levels in the Reservoir Bog and the Middle Bog. He stated that there were no detections as high as the maximum contaminant level (MCL) which was 0.02. Mr. Szymoniak stated that there was a connection to Flax pond via a small ditch, and asked Mr. Montague if he had used the channel in the past to get water into Flax Pond. Mr. Montague replied he had. He stated that the channel was maintained for fish runs. He stated that Flax Pond itself could only provide enough water to run the Herring run for a few days. Mr. Montague stated that it was necessary to channel water from Pond 14 into Flax Pond in order to have enough continuous flow for the fish run. Mr. Szymoniak stated that one alternative would look at whether there was a way to improve the outlet to get more water. He stated that the goal was to get Pond 14 down to non-detectable levels to ensure that the lower bogs would come into production sooner.

Ms. Cathy Kiley noted that the channel for Flax Pond had been sampled in July and asked if that channel continued to be sampled. Mr. Szymoniak replied that there was no water in that channel at that time. She then asked if it was routinely sampled when there was water in the channel. Mr. Szymoniak replied that yes it was routinely sampled.

Ms. Gail MacRae asked if there were detections in LaSalle Bog. Mr. Szymoniak replied that the LaSalle Bog was not disconnected from the river and therefore would continue to have detections. She asked if the irrigation well that had been installed was non-detect for EDB? Mr. Szymoniak replied that it was important to remember to differentiate between surface water and groundwater. He pointed out that the well Ms. MacRae referred to was approximately 50 feet deep and was sampled and determined to be non-detect in terms of groundwater. Mr. Szymoniak noted that these wells would continue to be sampled on a monthly basis.

Air Sampling:

Mr. Szymoniak reported that an air-sampling event was conducted in July and August of 1997. He pointed to the location of the highest concentrations of EDB. Mr. Szymoniak stated that the Massachusetts Department of Public Health (MA DPH) identified a potential risk for human health exposure through air. He stated that seven different air measurements were taken over a two-week period and the highest level reported was 0.007 nanogram parts per volume. When that information was factored in, and a risk assessment was conducted on those numbers, it was determined that the level was within the risk range from the US EPA. He reported that it was during this time frame that the higher concentrations were detected at Station 14. Mr. Szymoniak stated that another sampling event was conducted in April 1998.

Shallow Groundwater Drive Points:

Mr. Szymoniak displayed a map of the shallow groundwater drive points. He pointed to a line of detections in the shallow groundwater. Mr. Szymoniak reported that twenty-six out of seventy shallow drive points had detections. He pointed to the location of the highest levels detected (the wetland area off of Broad River) and reported that the highest detection was 1.4 parts per billion (ppb). Mr. Szymoniak reported that measurements were also taken when the bogs were flooded to see how that changed the concentrations.

Mr. Steve Spear asked how deep the drive points were? Mr. Szymoniak replied that the drive points were four feet deep.

Groundwater:

Mr. Szymoniak stated that thirty groundwater monitoring wells had been installed within the area of the contamination. He stated that approximately sixteen wells were being sampled on a quarterly basis. The groundwater data suggested a deeper plume beginning to upwell (he pointed to the location of the upwelling) and have strong vertical gradients. Mr. Szymoniak pointed to where a lower piece was found which was bounded by several wells. Those wells had detections at fifteen feet in December 1996 and a ten-foot layer was detected at approximately 100 feet. Mr. Szymoniak reported that there were six leading edge wells located downgradient of the "finger" of the plume. He pointed to the location where the remainder of the plume wanted to upwell.

Mr. Szymoniak reported that before EW-1 was turned on, the highest levels detected were seventeen ppb at 69MW1304. He reported a "hot spot" with detected levels of ten to seventeen ppb. Mr. Szymoniak

stated that the plume was approximately 1000 feet wide, and there were non-detect wells on either side used to help define the plume itself.

Dissolved Oxygen (DO) and Temperature Trends:

Mr. Szymoniak reported that temperature and DO measurements in different parts of the river were taken this summer. He stated that when EW-1 was turned on, there was a problem with low DO. A vertical bubbler had since been installed and the DO level has increased. Mr. Szymoniak stated that a probe was used at two different locations to measure the affects of the river on the temperature and the DO. He stated that the measurements were taken in July 1998, and the temperature of the samples within the bog and the DO within the bog had a very strong diurnal affect. Mr. Szymoniak reported that the DO was very high during the day and very low at night.

Mr. Szymoniak reported that the temperature upgradient was steady at 25 degrees Celsius. He commented that the groundwater gradient wanted to suppress groundwater, and therefore there was no upwelling in the groundwater before it reached the Baptiste Bogs. Mr. Szymoniak stated that further south there were influences from the EW-1 discharge and the groundwater.

Ms. Kiley asked Mr. Szymoniak to point out the location for 69SW0019.

Conceptual Site Model:

Mr. Szymoniak then displayed a slide titled "EDB Isoconcentration Along Cross-Section A-A' of FS-28". He reported that the concentrations were based before EW-1 was installed. Mr. Szymoniak stated that additional wells were currently being sampled. He noted that there were concentrations in MW1300 as high as 0.3 ppb. If the model was correct than there was another small piece of the plume upwelling that was greater than what would have been predicted.

Mr. Szymoniak reported that upgradient wells located in the small "finger" were being sampled in order to determine what happened to the concentrations. He stated that a screening well would be installed at two locations. Mr. Szymoniak reported that the conceptual model indicated that the majority of the plume wanted to upwell and come into the Coonamessett River (he pointed to the location). He stated that the monitoring results did not currently agree with the model. Mr. Szymoniak reported that EW-1 was installed to prevent the hot spot from upwelling.

Mr. Mike Jasinski, of the US EPA, asked when the screening wells would be installed. Mr. Szymoniak replied that they would be installed within the next month. He noted that one well will be installed between 69MW1295 and 69MW1296 and another well will be installed between 69MW1285 and 69MW1303.

Mr. McDermott asked why money was being spent on screening wells now, if a decision was going to be made next week. Mr. Szymoniak replied that if the wells were installed, the alternatives would not change. He said that the intent was to determine how affective EW-1 was at removing the "hot spot". That information may help better understand how the model was performing.

Agenda Item 4. Response Actions:

EW-1:

Mr. Szymoniak reported that one of the response actions was the installation of EW-1. He pointed to the location of EW-1 and reported that this well was pumping at a rate of 780 gallons per minute (gpm). Mr.

Szymoniak noted that this was a granular activated carbon system that was equipped with two canisters of carbon one to be used as a back up. Mr. Szymoniak stated that to date the carbon canisters have been changed twice. He stated that a pump test had been completed within the first five days of operation. The pump test data will be used to recalibrate the model.

Mr. Szymoniak displayed a model of the particle tracks. He explained that this was from a piece of the "Zoom Box" in the groundwater model. The slide showed particle tracks that were seeded at Hatchville Road. Mr. Szymoniak reported that this cross-section was proposed in December 1996. He explained that the cross-section was a seeding of particles that resemble the plume at a particular location. Particles would be seeded into the model to determine where they went in the hydraulic conditions implemented by the model. Mr. Szymoniak reported that with the well turned on, the majority of the plume was captured by EW-1. Mr. Szymoniak pointed to the location of 69MW1303 and noted that at 600 gpm it could be pulling some contamination back.

Ms. Kiley commented that she wanted to clarify that this was just a model prediction of the upwelling and groundwater flow. She asked if there was a more updated cross section of the plume available, once EW-1 was turned on. Mr. Szymoniak replied that more sampling would be done to update the cross section. Ms. Kiley noted that the cross section Mr. Szymoniak displayed was dated 1996.

Capture and Influent:

Mr. Szymoniak reported that the concentrations on October 17, 1998 were approximately 4.1 ppb. He went on to say that on December 20, 1998 the concentrations dropped to approximately 0.8 ppb.

Mass Removal:

Mr. Szymoniak stated that there were approximately 1100 data points from which information was used to create a three dimensional plume shell. He stated that the plume shell allowed for the calculation of the volume of the contaminant mass, which represented approximately seven kilograms of EDB. Mr. Szymoniak stated that different alternatives were modeled for the EW-1 evaluation report that was issued in March. He stated that Alternative A, "No Action", did not include the installation of EW-1. Alternative B1 included EW-1 pumping at a rate of 600 gpm. Mr. Szymoniak stated that the mass removal was considered for one year, two years, five years, ten years and fifteen years. Alternative B2 included EW-1 pumping at 400 gpm. He noted that there was not a lot of difference between pumping 400 gpm and 600 gpm. Mr. Szymoniak reported that Alternative C, Alternative D, and Alternative E were also modeled. He reported that Alternative C included EW-2. Alternative D looked at installing a third extraction well. Mr. Szymoniak concluded that between Alternatives "A", "B", "C", and "D" the same amount of removal was obtained with EW-1 pumping alone. He stated that the pumping rate could be as low as 400 gpm and the same mass removal would be achieved. Mr. Szymoniak pointed to the portion of the plume that would not be captured and go to the Coonamessett River. He stated that after fifteen years approximately twenty-two percent of that mass would have been lost to the Coonamessett River.

Ms. Liz Koulheras asked if Mr. Szymoniak was implying that if more wells were added the removal would be the same? Mr. Szymoniak replied it would. Ms. Kouhleras then asked if the time period could be shortened. Mr. Szymoniak replied that the time period would not necessarily be shortened. He noted that the last alternative discussed included shallow drive points, however a larger volume would be pumped in order to "keep up". Mr. Szymoniak stated that pumping a large volume could reduce the timeframe. He remarked that Alternative D, which was pumping 1100 gpm, resulted in pumping clean water.

Mr. Szymoniak stated that the modeling was done to determine if installing additional extraction wells would result in better mass capture and better mass removal. The results of modeling indicated that would not necessarily happen. Mr. Szymoniak commented that Alternative E involved installing drive points and pumping a large volume, which may be successful.

Mr. Szymoniak stated that he was providing information regarding what had been done, what would be done, and how the alternatives were developed. He stated that the EW-1 Mass Removal/Modeling table had not been included in the report that was issued in March.

Mr. Szymoniak stated that, based on the model, the piece of the plume that migrated beyond EW-1 would clean itself out within a course of seven to ten years. He stated that the concentrations that surfaced were used to calculate the risk to cranberry workers, and the risk was determined to be marginal. The model predicted that EW-1 would need to remain in operation for ten years.

Ms. Kiley asked where the ten year figure came from. Mr. Szymoniak replied that the data indicated that the concentrations in the well start to go to no-detect. Ms. Kiley then asked if EW-1 was turned off, would the rest of the FS-28 plume continue to discharge? Mr. Szymoniak replied that the concentrations were so low, that by the time they reached the surface it would likely be non-detect. Ms. Kiley asked if there were high concentrations of EDB around the Coonamessett Pond. Mr. Szymoniak replied that those would probably reach the EW-1 well within ten years. He reiterated that this would need to be re-considered in the Feasibility Study (FS). He stated that there was additional data collection in the Crane Wildlife, which could now be used to generate another plume shell to look at this alternative and determine how long the EW-1 would need to remain in operation. Mr. Szymoniak stated that there was still some uncertainty in terms of the concentrations of the uncaptured portion of the plume. He noted that although there was a model, it may not be correct and, therefore, the model needed to be monitored.

Surface Water Trends:

Mr. Szymoniak stated that since January 1997, measurements of the Coonamessett had been taken at four different locations; Station 58, Station 6, Station 46 and Station 49. He reported that the EW-1 well went on-line in October 1997. Mr. Szymoniak reported the data indicated that until February 1998, Station 58 and Station 6 "mirrored" each other. He explained that there was no groundwater recharging in that particular reach. Mr. Szymoniak noted that a lot more water had been going into the abandoned bog. Mr. Montague stated that about a year and half-ago cement bags had been placed down stream of the culvert in order to elevate the water enough to allow the fish to get through the culvert.

Mr. Szymoniak stated that the elevations had been rising, and consequently more water was being lost to the abandoned bog. This trend will need to be monitored. Mr. Szymoniak stated that the stations were measured on a monthly basis. He noted that the peak flows in the river were seen in April/May, and the lowest points in October/November. Mr. Szymoniak commented that discharge would continue to be measured.

Mr. Szymoniak displayed a slide showing the EDB concentration versus time in the surface water of the Coonamessett River. He noted that 69SW0014 was located at the confluence of the Broad River and the Coonamessett River, where higher concentrations were seen. Mr. Szymoniak stated that 69SW0024 was located at the outlet of the Baptiste Bog, and 69SW0049 was located just before the Coonamessett River went into Pond 14. He reported that 69SW0014 showed the highest detection. The average concentration in the river at 69SW0014 was approximately 0.15 ppb. Mr. Szymoniak stated that the intent was to evaluate what happened to EW-1 with the surface water concentrations, and to determine if they will drop over time. He stated that the model showed that a significant drop in the surface water concentrations

was not expected for about a year. Mr. Szymoniak stated that additional data collection was needed to determine whether the trend held true.

Mr. Szymoniak stated that the Baptiste Bog was flooded in October 1997. EDB concentrations were then measured every two days at two stations (69SW0024 and at 69SW0049). He noted that the concentrations were fairly high before the bogs were flooded. The bog became flooded by October 11, 1997 and there were still detectable levels in the Baptiste Bogs, however the concentrations were approximately 0.01 ppb. Mr. Szymoniak stated that non-detect was achieved in Pond 14. He stated that there could be levels of EDB in the river system at the Baptiste Bog, while still achieving non-detect at Pond 14.

Mr. Costa asked if the heavy rain that occurred in the spring and the early summer factored in to interpreting the results this year. Mr. Szymoniak said that this was a groundwater fed stream and therefore, storm events did not necessarily have a big affect on the stream itself, with the exception of times the bogs were flooded.

Groundwater Trends:

Mr. Szymoniak displayed a slide of monitoring wells, which had been sampled on a quarterly basis. He noted that 69MW1284A and 69MW1284B were located immediately upgradient of EW-1 and 69MW1303A and 69MW1303B were located approximately 300 to 400 feet downgradient. He noted that the "A's" were the higher screens. Mr. Szymoniak pointed to the zone of the EW-1 influence. He noted that these wells were located above a silt layer. He stated that the concentrations both upgradient and downgradient remained fairly high. Mr. Szymoniak reported that before the well was turned on, the upgradient station 69MW1284 was up as high as 11 ppb and has currently stabilized at around 8 ppb. Mr. Szymoniak expressed a concern with regard to EW-1, because the plume was very thick at Hatchville Road and there was a possibility that the contamination could go over the top and not be captured by a well. He stated that currently, due to the pumping, the polar depression was very steep at the top and wider at the bottom. Mr. Szymoniak commented that because the data was not as clear as it could have been, a well needed to be drilled outside the radius of influence. He stated that he would have expected that the downgradient well would have started to drop-off, and until the August sampling results, that trend was holding true. He went on to say, however, that the August results indicated a higher detection of approximately 6 parts per million (ppm). Mr. Szymoniak stated that it was important to make sure that the 6 ppm was not rising to the surface.

Mr. Szymoniak displayed a graph of the EDB concentrations at 69MW1285 and 69MW1291. He reported that 69MW1285 was the first well installed in October 1996, and had a detection of EDB at fifteen feet. Mr. Szymoniak stated that the concentrations were expected to rise for awhile and then decrease. There was no discernable trend in terms of the data. Mr. Szymoniak commented that the Broad River influence, providing clean water into the plume, could have dropped the concentrations; however, that trend had not yet been seen. He pointed to the location of 69MW1291A and stated that at this location, clean water was being seen underneath the plume. Mr. Szymoniak stated that 69MW1291B seemed to have the same trend in terms of the concentrations being seen. He noted that the "B" well was deeper than the "A" well.

Mr. Szymoniak displayed a graph of the EDB concentrations at 69MW1300. He pointed to the location of this well and noted that it was on the Augusta Dike. He commented that a small "finger" of the plume had been identified at approximately 100 feet deep. He stated that there were approximately six downgradient wells that would continue to be monitored. Mr. Szymoniak reported that those wells were non-detect as of August 1998.

Ms. Kiley asked Mr. Szymoniak to interpret why there was not much change in concentration in the downgradient wells. Mr. Szymoniak pointed to the location of the EW-1 influence and stated that it may take another year before the affects would be seen. He stated that within the next few months, the concentrations might drop; however he expected them to slowly increase or remain the same. Ms. Kiley asked if Mr. Szymoniak had considered an extraction well north of Hatchville Road. Mr. Szymoniak replied that was not part of what was being done. He stated that would be covered in the FS. Ms. Kiley then asked if it was clear that, when looking at EW-1 and potential interim actions, like adding additional wells, there was still a focus on additional wells between Hatchville and Turner Road. Mr. Szymoniak replied that the investigation had been focussed on everything south of Hatchville Road.

Ms. Muramoto asked if bog flooding affected the concentration of EDB in the groundwater. Mr. Szymoniak replied that he did not know that answer. He stated that more sampling was needed.

Ms. Selman asked if when clean water was introduced into a bog area there was no drop in the concentration in the plume, as was expected. Mr. Szymoniak pointed to where clean water was being discharged. He pointed to the location where treated groundwater was discharging at a rate of 1.5 CFS. He stated that the concentration levels were probably lower; however, there was no discernable pattern. Mr. Szymoniak stated that it could have an affect, although it would not likely be a large affect. Ms. Selman asked if reintroducing clean water would have a positive affect. Mr. Szymoniak replied that most certainly it would have a positive affect.

Mr. Tripp commented that the issue might be dilution of the stream water with clean treated water that was pumped from the wells. Mr. Szymoniak stated that clean water was being added to the location of the upwelling at 600 gpm, and therefore there would be some dilution. He referred to the slide titled "Coonamessett River – Surface Water, EDB Concentration vs. Time" (page 29) and pointed to where the clean water would be added at a rate of 600 gpm. He stated that as clean water was added, there was a possibility of dilution. Mr. Tripp asked what the relative importance was of the two processes, the dilution with the clean treated water, versus the depression of the plume and not allowing it to come up into the river. Mr. Szymoniak replied that the actual changing of the heads was greater than the dilution of adding clean water.

Mr. Szymoniak summarized that the concentrations could be changed by controlling the flooding of the bogs. He also stated that monitoring needed to continue to ensure that the hypotheses were correct.

Ms. Selman asked why not close the bogs until the problem was solved. Mr. Szymoniak replied that closure was one of the options. Ms. Selman commented that the closure option was the answer.

Ms. MacRae asked if it was correct to say that when the bogs were flooded, there was non-detect in the surface water; however the influence of the EDB on the groundwater was unknown. Mr. Szymoniak replied that there was not enough data to answer that question. He commented that if the bogs were flooded for a long period of time, the migration up may be slowed. Mr. Szymoniak noted that there was an attempt to keep the hydraulic heads the same as going through the alternatives.

Mr. Field provided a summary of the first half of the morning session. He stated that there was a three pronged approach and additional work was needed. The EW-1 well was in place and being monitored. Mr. Field noted that this was tied to a larger investigation, the SWOU and the RIFS process under CERCLA. The RIFS addressed the risk and whether EW-1 was enough, or if additional work was necessary. Mr. Field stated that another issue being discussed was the idea of a bog/river separation plan for surface water. Mr. Field stated that ongoing monitoring was occurring in stream flows, at different locations in the surface water and also at different depths within the groundwater. Mr. Field listed the key issues/concerns that had been raised: (1) the portion of the groundwater plume going past EW-1, (2) bog

flooding decreasing the upwelling from the groundwater to the surface water, which in-turn decreases the surface water concentrations, and (3) uncertain trends in terms of below EW-1. Mr. Field then turned the meeting over to Ms. Balkus to explain the alternatives.

Agenda Item 4. Alternative A – EW-1 and Buy Out:

Ms. Balkus stated that Alternative A was a Buy Out. She explained that EW-1 will continue to operate and the Air Force could either acquire the land, continue to acquire the crop by compensating the growers and the town, or via a long-term lease. Ms. Balkus explained that during the five to ten year period, the Air Force would provide the compensation and maintain the bogs in a useable condition. She stated that some controls may be installed to limit access if necessary. Ms. Balkus stated that sampling and monitoring would also continue.

Ms. Balkus listed the advantages to this alternative:

- No disruption to the current use of the bogs
- The bogs and channel would be maintained
- The exposure to food chain would be limited

Ms. Balkus then listed the disadvantages to this alternative:

- The bogs would not be able to go to harvest for a period of seven to ten years
- There would be no improvement to the bogs to be able to separate them from the river or from the contamination
- Additional legislative authority from congress was necessary

Questions and Answers:

Mr. McDermott said that earlier he had asked how much money was available for these various alternatives, because in his opinion the bogs should be bought and their use as cranberry bogs terminated. He then asked how much money was available for the possible purchase, and how much did each alternative cost. Ms. Balkus replied that the Coonamessett part of this system cost approximately $700,000.00 per year to buy out the crop. She stated that this figure was based on buying the crop and did not include purchasing the land. Ms. Balkus noted that she did not have a dollar amount for that real estate investment.

Mr. Spear asked if this would apply to all the bogs, or part of them the Lower Baptiste for example. Ms. Balkus replied that at this time a complete buy out was proposed. She went on to say, however, that in the discussions this afternoon, it may become evident that it would be most cost affective or beneficial to buy out some bogs and no longer have them in production, and do something else for the other bogs.

Mr. Patton asked if the options were to acquire the land, acquire the crop, or a long-term lease. He asked if acquiring the land without then generating any revenue from it, was an option. Ms. Balkus replied that acquiring the land was a possibility. She commented that the United States Air Force did not usually purchase land. Mr. Patton asked if that was still part of Alternative A. Ms. Balkus replied it was.

A member of the audience asked if the advantages and disadvantages of proceeding with Alternative A in cooperation with the community, as opposed to buying out the community, had been considered. Ms. Balkus replied that those ideas needed to be explored further. She added that the alternatives would not

be completely developed without input from the stakeholders. She emphasized that these ideas were brought to the table in order to explore them cooperatively.

Mr. Costa asked for a definition of "bog maintenance" in terms of water management, and pesticide and fertilizer application. Ms. Balkus replied whatever long-term decision was made will determine the required level of maintenance. She stated that if the town wanted the bogs to be in operation, she proposed that the bogs would be maintained as usual, with the exception of actually producing the crop.

Mr. Bicki asked why the funding could not come out of the Department of Defense (DoD), rather than having to go to the Legislature on a year to year basis. He asked why the DoD fund could not buy the cranberries as a food commodity, and then destroy them. Ms. Balkus replied that currently the Air Force was funded under the Environmental Restoration Account, specifically for environmental cleanup. She stated that there were other DoD funding mechanisms, however she was not aware of them. Mr. Bicki then asked if destroying the cranberries would not be part of the remediation. Ms. Balkus replied not necessarily. Mr. Bicki suggested exploring that possibility.

Ms. MacRae asked how the berries would be prevented from forming. She commented that this year, the proposed plan did not appear to have worked, because there were berries on the bogs. Ms. Balkus replied that this year the timing was "off" in terms of flooding the bogs to prevent the flowers from appearing. She stated that next year the flooding would be timed better. She noted that the vines needed to go through a regular growing cycle in order to be maintained in a healthy condition.

Ms. MacRae remarked that Ocean Spray used a certain amount of their cranberries for research. She asked why Ocean Spray could not buy the berries, if there was no EDB detection, and use them in their research. Mr. Bicki replied that he was not sure what Ms. MacRae was referring to in terms of "research berries". Ms. MacRae stated that in the past people have said that Ocean Spray did not take a loss, because they used berries to test, to sample, and for other research. Mr. Bicki stated that he worked in the research group at Ocean Spray, and he was not aware of the purchasing of any berries for research. He stated that the research was related primarily to production and insect control, and not to the manufacturing end of using contaminated fruit. Ms. MacRae asked if Ocean Spray used cranberries to determine if there were ways to improve the production of cranberries, or use less pesticides. Mr. Bicki replied that would not be related to these particular bogs. He stated that Ocean Spray did not dictate how the 750 farmers, that were member of the cooperative, should grow their crop. He suggested that the University of Massachusetts (UMASS) might be interested in pursuing that option. Ms. Balkus noted that the UMASS experiment station was a good idea.

Ms. Selman asked why not let the bogs go dormant rather than fertilizing and spraying. She noted that a lot of money could be saved, and then used to replant the bogs with fresh, clean, healthy vines. Ms. Balkus replied that the town owned the land, and therefore the Air Force could not decide what to do with the land. She also stated that it required three to five years to establish a cranberry bog, which would be avoided if the bogs were maintained. Ms. Selman commented that the plants were already unhealthy. Ms. Balkus stated that KSU was currently conducting two studies to determine if the berries absorb EDB through the skin and also to determine if EDB could uptake into the plants. She stated that it could not definitively be said that the cranberries were contaminated.

Ms. Selman remarked that with all the research on the bogs, the effort to keep them stable for seven years, and all the money that would be spent, it made sense to just "let the crop go" and refurbish the bogs in five years. She stated that this was a contaminated area anyway, and more contamination would be added by spraying for bugs when the berries would not even be eaten. Ms. Selman stated that this did not make sense.

Mr. Montague asked what had been learned about when the bogs needed to be flooded to keep them from flowering. He commented that if the bogs needed to be flooded earlier, there may be conflicts with the fish running. He stated that a new ladder system would need to be considered to allow the fish to migrate up. Ms. Balkus stated that there were four different kinds of vines on the bogs. She explained that different vines bloomed at different times, and therefore, a different flooding source may be needed to ensure that each vine type could be flooded when its respective flowers were blooming.

Mr. Jasinski asked if the $700,000.00 per year was just for the buyout and did not include the cost of EW-1 for seven to ten years. Mr. Szymoniak replied that on a routine basis there would be three carbon change-outs at a cost of $20,000.00 each. Mr. Jasinski asked if it was correct to say that for all the alternatives EW-1 would cost about $100,000.00 per year. Mr. Szymoniak replied that was correct.

Ms. Balkus noted that although she did not discuss the "No Action" Alternative, there was a possibility of doing nothing.

Agenda Item 5. Alternative B – EW-1 and Channel Realignment:

Mr. Szymoniak briefly explained Alternative B. He stated that Alternative B included EW-1 and realigning the channel in the Baptiste Bog. Mr. Szymoniak stated that when the cranberries needed to be harvested, there was a conflict with the herring migration, and it might be beneficial to separate the bogs from the river and leave out the river on one side of the stream. This will separate where the EDB was actually upwelling, preventing it from coming back up into the river system. Mr. Szymoniak stated that portion of the channel would be lined in order to prevent the water from upwelling into the river system. He said that there was a concern about temperature, and therefore temperature and DO measurements were done. Mr. Szymoniak stated that the channel would be realigned from the beginning of the Baptiste Bog and through the Baptiste Bog, approximately 3100 feet. He stated that an interior and exterior berm would be created. He stated that the interior berms will be approximately ten feet wide and the exterior berms will be approximately fifteen feet wide. Mr. Szymoniak stated that the channel was approximately nine feet wide. He stated that some of the dikes will be raised in order to provide more storage capacity, and two basins will also be created in order to look at the passive treatment of the EDB. He stated that Alternative B included two diffuser barriers and a floating baffle. Mr. Szymoniak stated that the intent was to drop the EDB concentrations to about ten fold.

Mr. Szymoniak listed the advantages of Alternative B:

- separates the flow to control upwelling
- improves the fish pathways
- created a riparian zone on the homeowner side of the river

Mr. Szymoniak then listed the disadvantages of Alternative B:

- disrupts the current channel
- relies on the understanding of water movement
- EDB in the upper river system

Mr. Szymoniak noted that Alternative B did not include treatment, but rather relied on passive treatment and controlling the flooding of the bogs.

Questions and Answers:

Mr. McDermott asked if there will still be flow through the bog south of Thomas B. Landers Road, with the apparent problems of herbicides and pesticides gaining access into the river. Mr. Szymoniak replied that was correct. He stated in regard to the East Thompson Bog, that EDB was still possibly in the river. Mr. Szymoniak stated that with this alternative, there was a possibility that the East Thompson Bog would go out of production.

Mr. Bicki asked what would happen if the channel was lined for 3000 feet, considering the upwelling would still be occurring. Mr. Szymoniak replied that the upwelling would not be occurring in this particular channel. Mr. Bicki noted that even if the upwelling did not occur in that channel, it would "squeegee" to some place. Mr. Szymoniak remarked that the idea was that it would squeegee to the inside. He stated that the purpose of the basins was to create more of a preferential flow path for the upwelling to occur inside the basin.

Mr. Gordon asked about the approximate acreage lost with Alternative B. Mr. Szymoniak replied a total of nine acres could be lost.

Mr. Spear asked if the entire Lower Baptiste Bog would be taken out of production. Mr. Szymoniak replied that the Lower Baptiste Bog was out of production, with the exception of one acre. He went on to say that the upper bog, which represented approximately a half an acre, may also be taken out of production.

Ms. Selman noted that realigning the channels would also entail providing and using alternative water sources. Mr. Szymoniak replied that an alternative water source might need to be provided, due to the EDB in the river. Ms. Selman commented that looking at the West Thompson Bog, the Augusta Bog, and the East Thompson Bog, it seemed unthinkable to use Round Pond as an alternative water source. Mr. Szymoniak stated that this was part of the phased option. He stated that the river was now clean, and if the levels of non-detect were maintained, there was no need to use Round Pond in Alternative B.

Ms. Kouhleras commented that Mr. Szymoniak just stated that the river water would be clean; however under "Disadvantages" it was listed that EDB would still be in the upper river system. Mr. Szymoniak replied that the river was only non-detect when it was flooded.

Ms. Koulheras asked if the loss of nine to ten acres referred to all bogs. Mr. Szymoniak replied that was correct. Ms. Kouhleras then asked what the best estimates were that the upwelling would occur in the basins, if the stream were lined. Mr. Szymoniak replied the upwelling was being kept out of the river, and a preferential flow path was being provided. He stated that the channel would be moved to the outside edge where there was very little groundwater that upwelled. He also stated that because of the berms, there was no place for the water to upwell until it reached the bog.

Ms. Koulheras asked if there would still be cranberry bogs on the side of the river where the basins were located. Mr. Szymoniak replied those bogs would be out of production. Ms. Koulheras asked what was the volume of material that would be removed to create the basins. Mr. Szymoniak replied three feet over approximately four acres would be removed. Ms. Koulheras asked if analysis had yet been done on the soils that would be removed. Mr. Szymoniak replied that the soils were all sand. He added that the drive points were done, and there was sludge material in the channel. Ms. Koulheras noted that there was organic mass on top of the sand. She also noted that this would be a large volume of material to try to dispose of, and there needed to be a thought of whether there were any contaminants in that soil and where the soil would go. Mr. Szymoniak stated that sampling had been done for ecological purposes and

high levels of contamination were not found. He stated that there was a possibility that some of the sediment could contain EDB because of high moisture content in the solids.

Ms. Koulheras asked if sampling was done for other contaminants that might be associated with bog production, and not necessarily EDB. Mr. Szymoniak replied testing had not been done for pesticides.

Ms. Kiley asked what would be the depth of the pond if it were created in the Lower Baptiste area. Mr. Szymoniak replied three feet. Ms. Kiley then asked if the heads would be maintained to allow the upwelling to continue. Mr. Szymoniak replied they would. Ms. Kiley clarified that for normal operations, and not during the harvest, the heads would be maintained. Mr. Szymoniak replied that was correct. Ms. Kiley then asked if the water would flow in its' normal flow path over the weirs. Mr. Szymoniak replied that was correct. Ms. Kiley asked if there was a contingency for EDB still in the river at that point, and what exactly the flow would be one or two days? Mr. Szymoniak replied approximately two days.

Mr. Koehler asked what would happen to the water in these ponds. Mr. Szymoniak replied that it was a flow through system, it would come out and go back into the river. Mr. Koehler asked what the purpose was of the pond. Mr. Szymoniak replied the purpose of the pond was to separate the river in order to flood independently of the fish run. He added that the heads could be controlled without having to worry about the fish run. Mr. Koehler then noted that this would not get rid of the EDB. He commented that it appeared as though the pond would be used to allow the EDB to gradually "get out into the air". Mr. Szymoniak replied that half of the solution was volatilization. He stated that there may be some loss through volatilization, however, not of a great proportion.

Mr. McDermott asked if the fish would be going into that pond. Mr. Szymoniak replied the fish would be going to the new channel and back to the river. Mr. McDermott then asked what was the cost of this alternative. Mr. Szymoniak replied $650,000.000, which included a "one shot" construction and the loss of a couple of bogs. Mr. McDermott commented that cost did not consider the lost production of the bogs or the cost of EW-1 operation.

Agenda Item 6.Alternative C1 and C2 – EW-1 and Channel Realignment and Treatment:

Mr. Szymoniak briefly explained that Alternative C relied on using the same basin concept, however not actually creating the ponds, but rather doing the removal using shallow groundwater well points. He noted that the well points were approximately 50 feet in depth and located in the areas of the detections found from the drive point sampling. Mr. Szymoniak stated that pumping at rates of 1500 gpm and 1800 gpm were considered. He pointed to the header pipes, which would be located on the ground surface. Mr. Szymoniak stated that in the winter the bogs might be flooded. The water would be taken out and taken back to the treatment plant, which would need to be expanded in order to handle the volume of water. He stated that the current treatment plant would be increased from 600 gpm to about 2400 gpm, which would remove the shallow groundwater and discharge the volume back into four different locations. He noted that the increased pumping rate was effective at reaching non-detectable levels. Mr. Szymoniak stated that power would need to be provided to the pump house building. The basins were a back-up if there were a power failure. Mr. Szymoniak stated that the treatment plant building would need to be expanded, and a secondary road would need to be created.

Mr. Szymoniak stated that Alternative C cost approximately five million dollars. The operating cost would run approximately $200,000.00 per year, and six acres of bogs would be lost.

Mr. Szymoniak listed the Advantages of Alternative C:

- Gets entire river to non-detect
- Flexible in terms of location of well points
- Protects the public

Mr. Szymoniak then listed the Disadvantages of Alternative C:

- Treating a large volume
- Iron bacteria and fouling
- Operation and maintenance
- A pilot test was necessary to identify the location of the wells

Ms. Selman asked about the iron and bacteria level. Mr. Szymoniak replied that the iron levels detected ranged from 400 to 500 ppm. He stated that the level used for treatment was about 300ppm, which was also the secondary drinking water standard. Mr. Szymoniak stated that at fifteen feet the iron levels would still be fairly low, and hopefully be passed through the carbon system without having to do treatment.

Ms. Selman then commented that Round Pond was a small pond that had an iron level of 1.3, noting that the acceptable drinking water level was 0.3. She stated that she had to triple filter her water for drinking. She stated that her well was at thirty feet. Mr. Szymoniak stated that a pilot test would be important. He explained that approximately twenty gpm would be pumped, which was not a large volume per well. Mr. Szymoniak stated that the iron levels may vary depending on the location in the bog.

Ms. Selman commented that when alternative water sources were used to take care of these bogs, it would affect the drinking water sources in wells around the area that were not affected by EDB. She went on to say that water would be taken from a shallow tiny pond, where a lot of wildlife and fowl took refuge. She noted that the wildlife population had tripled in the last few years. Ms. Selman also commented that it took a long time to bring the level of Round Pond back up. Mr. Szymoniak stated that the entire pond would not be drained. He noted that the acceptable level that that pond would be lowered was less than half a foot.

Ms. Selman noted there were three bogs that were separated from the river. Mr. Szymoniak stated that all the water that went to the other bogs would come from the river where it currently came from, and not from Round Pond. Ms. Selman commented that there must be a misprint in the handout, because it stated that the Augusta Bog was already separated from the river, and an alternative water source was needed, such as Round Pond. Mr. Szymoniak stated that Ms. Selman was referring to Alternative E.

Mr. Szymoniak stated that the second part to this alternative, Alternative C2, did not include realignment of the channels, but rather installation of a header pipe, and operation of EW-1.

A member of the audience asked if the source of the EDB that was being treated was bypassing the extraction well. Mr. Szymoniak replied that was correct. The audience member then asked if it was correct to say that a small fraction of what was in the plume was currently being dealt with, because most of it was captured upstream. Mr. Szymoniak replied that was correct. He stated that the majority of the mass was captured with EW-1. He went on to say that there was a piece that could not be captured by EW-1, and an attempt would be made to capture it with the shallow groundwater. The audience member asked what was the fraction being dealt with in the treatments downstream. Mr. Szymoniak replied twenty-six percent of the overall mass. The audience member asked if the difference between Alternative B and Alternative C was that the treatment in "B" was, creation of the ponds and dilution, which were more "natural" processes, and Alternative C included more "engineering" processes. Mr. Szymoniak

replied that was correct. He stated that the idea of the basins was to provide clean water when the bogs needed to be flooded.

Mr. Montague asked if water could be sent back to the Coonamessett Pond to help maintain the pond level in dry periods, if more extraction were done and more water were moved. He asked if that was a viable option. Mr. Szymoniak replied that in this reach of the stream the groundwater was suppressed and tended to have a lower gradient that lost water in this particular reach. He stated that the best improvement might be to get more water out of Coonamessett Pond. He stated that the contamination in the plume would hopefully "go away" at some point. Mr. Szymoniak stated that adding water now would make more sense than running the water for ten to fifteen years.

Ms. Kiley asked if it was correct to say that Alternative C2 did not include realigning the river and therefore basins would not be generated, the drive points would be installed and the water would be pumped back up for treatment. Mr. Szymoniak replied that was correct. Ms. Kiley then asked if there was any lost acreage with this alternative. Mr. Szymoniak replied that the same bogs would be lost. He noted there would be pipes on the bog, however there was a possibility of working around the pipes to continue using the bogs. He stated that the Baptiste Bog would need to be used to control the flooding. Ms. Kiley asked if the East Thompson Bog would also be lost. Mr. Szymoniak replied that was likely.

Agenda Item 7. Alternative D – EW-1 and Separate All Bogs:

Mr. Szymoniak briefly explained that Alternative D included operation of EW-1, realignment of the East Thompson bog, construction of berms on either sides of the river and provision of alternative flood water or management water. He stated that this Alternative relied on the upwelling in the Lower Baptiste Bog to be controlled in order to provide the clean water for flooding. He noted that the source of the water was from the river.

Mr. Szymoniak listed the advantages of Alternative D:

- separates the entire bog system from the river
- improves the fish pathway
- in line with Town strategy

Mr. Szymoniak then listed the disadvantages of Alternative D:

- no buffer for floods
- need alternative water sources for flooding

Mr. Field asked how much Alternative D cost. Mr. Szymoniak replied the realignment materials would cost approximately nine to ten dollars a foot and approximately 10,000 feet would be needed. He stated that there was no loss of bogs associated with this alternative. He noted that one acre for every ten acres would be lost for installing the berm.

A member of the audience asked if water control measures could be designed into this alternative, in order to retain the water on the bog in times of nutrient or chemical application. Mr. Szymoniak replied there would be an inflow and outflow structure to control the water.

Ms. Selman commented that again this option required alternative water sources for flooding. She noted that there were three bogs that were already separated from the river, and there was mention of Round Pond as an alternate water source. Mr. Szymoniak stated that was one option. He stated that the other option was to use treated water from EW-1 at 600 gpm as alternative water. Ms. Selman stated that

Round Pond could not be used. Mr. Szymoniak stated that the purpose of this summit was to receive and evaluate that kind of input. Ms. Selman then commented that she had not seen anyone evaluating "anything". She suggested discussing other options. Mr. Szymoniak stated that Round Pond was one option. Ms. Selman noted that the activity taking place in this area has driven wildlife to Round Pond. Mr. Szymoniak continued that other alternative sources being considered were town water, or treated water from EW-1. Ms. Selman commented that when she has problems with her water, she was not allowed to take water from anywhere she wanted.

Ms. Shea asked what studies had been done before going into Round Pond. Ms. Shea commented that she saw the pond at its lowest in 1997. She then asked if Jenkins Pond, Spectacle Pond, or Shallow Pond would be used. She also asked how much water would be taken out per day. Mr. Szymoniak replied that the pond was sampled a year ago and the DO, temperature and depth of the pond was measured. He stated that surveying was also done to determine if the pond could be connected to the bog because of the gradient. Mr. Szymoniak stated that the water that would be drawn was about 600 gpm and only used to flood the bogs for winter protection. He stated that the two bogs also provided water for harvesting. He stated that approximately one foot over nine acres would be drawn over the course of three weeks. Mr. Szymoniak noted that the water would be taken out over a slow period of time to avoid dropping the elevation at Round Pond to unacceptable levels.

Ms. Shea commented that she strongly objected to any water being taken out of Round Pond. She also stated that she was not aware of this meeting until late last night and that explained the low attendance of residents.

Ms. Kiley asked if the local towns had been asked about the capacity, in terms of using a public water supply for these activities. Mr. Szymoniak replied that Ms. Balkus has spoken with Ms. Virginia Valiela, a Falmouth Selectman. Ms. Kiley asked if the response was positive. Mr. Szymoniak replied that he did not have that answer. He commented that personally he did not think it would be acceptable to use town water.

Ms. Koulheras noted that one of the advantages listed for Alternative D was an improved fish pathway. She asked if that improvement entailed separating the river from the bogs in order to separate the pesticide and fertilizer draining into the river that impacted the fish. Mr. Szymoniak replied that was one of the benefits. He explained that the other benefit was a better defined channel for the fish. He stated that currently there was a portion of the channel that was very confusing. Ms. Koulheras asked if there were the potential for change in the temperature and dissolved oxygen with the lined channel. She noted that there would not be the natural influences that could regulate the temperature. She stated that should be included in the equation. Mr. Szymoniak replied that temperature had been considered.

Mr. Braun asked in regard to Alternative D, if the channels would be lined. Mr. Szymoniak replied that Alternative B was constant through Alternatives "C" and "D". He explained that the Lower Baptiste Bog would need to be a lined channel. The intent was to control where the EDB was upwelling in order to use the dilution and the volatilization as the basis to provide clean water. Mr. Braun asked how Alternative D isolated the EDB contaminated surface water. Mr. Szymoniak replied that the bogs would be separated by berms. He stated that when the bogs were flooded the upwelling could be controlled in order to achieve non-detect in the river. That water could then be used to flood the bogs. Mr. Braun asked how confident they were that none of that water would be surfacing into the bogs. Mr. Szymoniak replied a berm would be built preventing water from exiting the perimeter. He stated that none of the water from the river could enter into that dike. Mr. Braun asked if it was correct to say that there would be another channel inside the berm to direct the flow from the bog. Mr. Szymoniak replied that was correct.

Ms. MacRae commented that this was a summit of stakeholders, and yet it was not fair that the residents were never aware of this meeting. She noted that the newspapers were also unaware of these meetings. Ms. MacRae commented that public input was needed and this information should be presented in a public forum. She remarked that the people representing the town needed to hear the voices of the communities. She reiterated that the residents were stakeholders. Ms. MacRae stated that it was very unfortunate that the community was unaware of these meetings.

Mr. Spear noted that the placement of the berms could vary. He stated that the berms could be spaced widely apart with the intent of creating a "little" habitat on each side of the river. Mr. Spear stated that it may be necessary to provide some way for the water that naturally upwells within those bogs to "get out".

A member of the audience commented that isolating the river from the system was not an experimental option. He stated that currently there were examples of that throughout the state of Massachusetts. Ms. Koulheras noted that in this instance it would be on a much larger scale and typically the bypasses would not be lined.

Mr. Field asked if only Alternative B included lining a portion of the channel. Mr. Szymoniak replied that was correct. Only a small section of the river that was upwelling would be lined. Ms. Kiley noted that the portion of the contaminated groundwater downgradient of EW-1 would continue to upwell wherever it was currently upwelling. She stated that if the river was not lined elsewhere, the contamination could get into the river. Mr. Szymoniak stated that there was too small a volume and the concentrations were so low that it would probably be non-detectable.

Mr. Field suggested that it would be helpful to clarify the process and public involvement. He added that the next step would be to discuss the pros and cons of each alternative.

Ms. Valiela noted that there was a tremendous amount of information that was being provided at the meeting. She hoped that by the end of the meeting, the attendees would have opinions about each of the alternatives. She noted that the Town of Falmouth needed to discuss the alternatives with the Conservation Commission and the Bog Committee. She stated that the Conservation Commission would meet on Wednesday, September 16, 1998 to discuss the alternatives, the transfer of water from Round Pond, and the purchase of water from the Town. She mentioned that the transfer and purchase of water were two key concerns of the Town of Falmouth. She went on to say that a commitment would not be made at that time. She then suggested that the cranberry meeting scheduled for next Wednesday be postponed until after the Conservation Commission meeting.

Agenda Item 8. Alternative E – EW-1 and Phased Approach:

Ms. Balkus explained that the rationale behind the phased approach for Alternative E was an attempt to ensure that the stakeholders each got something out of the alternative.

Ms. Balkus then referred to E-1 and E-2, the top two Upper Baptiste Bogs. She reminded the attendees of the surface water data that indicated non-detect. She stated that the non-detect data meant that there was not a need for additional action, except for the continuation of the monitoring of the surface water. She reported that there were detections at the outlet of the E-3 bogs where the Broad River ran up against the bog. She noted that it was proposed to install a berm there to separate the bog from Broad River. She also stated that two flumes would need to be installed so that water could be transferred into and out of that bog, because the current interface would be cut off. She reported that one advantage would be that the bog would be separated from the river and would provide new inlets and outlets.

Ms. Balkus then referred to E-4, the Lower Baptiste Bog and reviewed the four options. She stated that the upper two bogs were non-detect and predicted that the crop would be marketable by the fall of 1999. She mentioned that the E-3 bog would not see a marketable crop until the year 2000, because of the berm that would be installed.

Ms. Balkus then referred back to Option #1 for the Lower Baptiste Bog--the creation of a 6 acre pond. She reported that approximately six-acres of the bog would be lost. At this point in the meeting, she reviewed the advantages and disadvantages for Option #1.

Ms. Valiela commented that the cranberry grower would be compensated this year and next for the loss of the six acres. She then asked if there would be a compensation issue following the next two years. Ms. Balkus replied that the compensation would have to be addressed and could not be fully determined at this point.

Ms. Valiela then referred to the earlier discussion on negative easement and asked if the land would be accessed through that type of arrangement. Ms. Balkus replied that it would be determined whether a negative easement, a long-term lease, or buy out would be most appropriate.

Ms. Balkus then referred to Option #2, a 3-acre pond. She explained that the goal was to decrease the concentrations from the inlet of the Lower Baptiste bog to the outlet from 0.1 ppb to 0.01 ppb. She then reviewed the advantages and disadvantages for Option #2. She stated that the degradation of EDB was the same as in option #1, but that Option #2 covered a smaller area and also attempted to provide for the fisheries, the wetlands, and the cranberry growers.

Mr. Spear asked if Option #2 would be less effective, because it was a smaller area and not as much EDB would be treated. Mr. Szymoniak replied that would be the theory. Mr. Spear asked whether option #2 could be modified into option #1. Mr. Szymoniak replied that it could.

Ms. Balkus reviewed option #3. The EW-1 pumping rate would be reduced from 600 gpm to 400 gpm to accommodate the shallow well points. She pointed out that the effectiveness of EW-1 would not be decreased, but that the remaining 400 gpm would be treated when coming out of the shallow well points. She added that there would be less of a loss of cranberry bog than the other options. However it would have to be determined whether or not an alternative water source would be needed to produce a marketable crop, in the event that the extraction well points were not able to reach a non-detect level.

Ms. Valiela asked if the shallow well points would be capturing the EDB that was ahead of the EW-1. She also asked whether the shallow well points were relatively deep. Mr. Szymoniak replied that there was a shallow portion that was affecting the bog, and there was a deeper portion as well. Ms. Valiela clarified that this proposal did not contemplate getting the slug. Mr. Szymoniak replied that the volume there was small.

Ms. Valiela then asked if cranberry operations could continue on, while the shallow well points were pumping year round. Mr. Szymoniak replied that he thought that was possible, but Mr. Handy would have to answer that question. Ms. Valiela asked if the six acres that would be lost was located near the installation of the shallow well points. Mr. Szymoniak replied that the loss would be more like three acres. He also stated that the problem was that an alternative water source would have to be provided, and there may still be EDB remaining. Ms. Valiela stated that she was trying to determine what would be best for the Town.

Ms. Valiela stated that if the bog were flooded, then it would be out of production, but if well points were installed, there would be a question about whether the bog went out of production or not. Mr. Szymoniak

reminded Ms. Valiela that Alternative #1 might leave some EDB in the river. Mr. Handy replied that there needed to be an active treatment. Mr. Szymoniak asked Mr. Handy if he could work around the well points if non-detect could be achieved. Mr. Handy replied that it would be difficult.

Ms. Valiela stated that the advantage to Alternative #3 would be that the bog would not be destroyed. Mr. Handy agreed.

Ms. Muramoto asked, in reference to the alternative water source, whether treated water from EW-1 would be sufficient in Option #3. Mr. Szymoniak replied that EW-1 would be sufficient if the well points were successful and the river system was non-detect. He mentioned that it was not likely to reach non-detect with the amount that was being pumped.

Mr. Field asked about the cost. Ms. Balkus replied that she was not sure whether every piece had been costed out.

Ms. Balkus then referred to the Augusta Bog. She reported that the surface water detections had been non-detect, and the bogs were already separated from the river. She stated that an appropriate alternative source to be able to flood those bogs had to be determined. She reviewed the advantages and disadvantages of Alternative E for the Augusta Bog.

Ms. Selman stated that someone had mentioned that they did not understand what her "hollering and screaming was about a few drops of water." She stated that if someone had done some hollering and screaming twenty-two years ago, then the situation would be different today.

Ms. Kiley asked whether a well for Mr. Augusta's bog was being considered as a potential water source for flooding. Mr. Szymoniak replied that it was not being considered because of the contamination in the lower portion. He mentioned the idea of installing a well to be used to extract water to flood the bogs had an adverse public reaction. He went on to say that a well could be installed and could clean up that portion of the plume because of the small volume. Ms. Kiley clarified that she was not recommending a well be installed where there was pollution. She said that there had been discussion about a well being installed on the other side of the reservoir. Mr. Szymoniak replied that the discussion had been about installing a well further east, where the Adams and LaSalle Bogs were located. Ms. Kiley asked whether the well for the Adams Bog could be used for the Augusta Bog. Mr. Szymoniak replied that had not been considered.

Mr. McDermott asked what the disadvantages were of cleaning up the UST spill. Ms. Balkus replied that cleaning up the spill was listed as a disadvantage because the pipeline would lie across someone's property, where there is also an underground storage tank spill that would have to be cleaned up. The advantage would be that the underground storage tank spill would be cleaned up, but the pipeline would have to installed. Mr. McDermott asked about boundary dispute. Ms. Balkus replied a couple of property owners were in dispute about boundaries, and that the land would be surveyed to clear up any questions about where the pipeline would be installed.

Ms. Selman asked whether a carbon filter could be installed for each bog, whether contaminated or not. Mr. Szymoniak replied that was a possibility however, the amount of iron that would be pumped through the carbon filter would cause maintenance problems. Ms. Selman asked whether the bog would be flooded in five days rather than two days. Mr. Szymoniak replied the growers would like to have it done in a three day period, because the temperature affects the vine and there was risk of damage if flooded too slowly.

Ms. MacRae stated that her property line extended over the ditch where the pipeline had been proposed. Mr. Szymoniak replied that property access would be discussed during public meetings.

Ms. Balkus then referred to the Adams Bog. She reminded the attendees that the surface water data had indicated that the top portion of the bog was non-detect, however where the river entered the bog, low levels of contamination were detected. She explained that the proposal was to install a berm to separate the bog from the river in the interior portion of the bog. She added that an alternative water source would also have to be added for flooding activities. Ms. Selman asked if Ms. Balkus was again referring to Round Pond. Ms. Balkus replied that Round Pond was one of the alternatives. Ms. Selman commented that Round Pond had been mentioned five times for five different bogs. She noted that Round Pond was barely able to harbor all of the wildlife already "hiding out" there. Ms. Balkus stated that she appreciated Ms. Selman's feedback.

Ms. Balkus went on to say that flumes would also have to be added to ensure the inflows and outflows of the bogs could trace the water in and out. She then mentioned that slide #51 was incorrect and should state that the cranberries would not be marketable until the year 2000, because the berm would first have to be installed. She added that the LaSalle Bog would also have to be bermed from the river.

Ms. MacRae noted that the LaSalle Bog recently went into operation. She pointed out that the Conservation Commission explained that the area may contain EDB, however the growers decided go ahead with the bog and accept responsibility. She stated that the LaSalle Bog was now part of the plan, and she did not understand why taxpayer's money should be used to protect the bogs of owners who were aware of the contamination before going into operation. Ms. Balkus replied that Ms. MacRae had a good point and that it would be looked into.

Ms. Sanderson stated that she was curious why this was the first time that "submit notice of intent" was listed. Mr. Szymoniak replied that most of the alternatives included notice of intent, but that it was listed now because it was the first alternative that was on the boarder of vegetative wetland. Ms. Balkus stated that was also true of the E-3 Baptiste Bog, where it was proposed to cut off at Broad River. Mr. Szymoniak pointed out that Mr. Handy already had a conservation plan for the Baptiste Bog.

Mr. Brodski asked what kind of permission would be needed to pump water from Round Pond if an alternative water source were needed. Mr. Szymoniak replied that there were actually two things that might be required. He stated that there was a surface water permit that may be required from the State, because more than a hundred thousand gallons of water per day may be withdrawn. Also, a notice of intent may be required. Mr. Brodski asked if any information had been gathered about the pond. Mr. Szymoniak replied that the only information that was gathered was sampling, which determined that EDB was not present. He added that volatile organic compounds (VOCs) were also sampled, as well as temperature, dissolved oxygen, and depth measurements. He stated that a survey of the ditch that runs into the Pond was also done. Mr. Brodski commented that the pond also connected to Jenkins Pond and clarified that the ditch to which Mr. Szymoniak referred was the one that ran into the Thompson Bog. He stated that water upwelled somewhere between the Thompson Bog and Round Pond. Mr. Szymoniak stated that there was a wetland between the Thompson Bog and Round Pond, and at one time there was a channel where there is an abandoned Cranberry Bog where water could flow from the Thompson Bog back to Round Pond. He stated that there was a small pipe there that controlled that flow, but that he was certain that there was groundwater that upwelled into that Bog. He also said that drive point sampling from the Thompson Bog did not detect EDB.

Mr. Spear commented that dikes or berms that were built on land of agricultural use did not require local, state, or federal permits. He then suggested talking informally to those agencies. He commented that the

dikes currently there would not require a permit, if they were on vined areas. He also said that it would be another story, if they crossed into a natural wetland.

Ms. Koulheras commented that all of the alternatives discussed, other than the No Action Alternative, would involve any number of state and federal permits before going forward with these projects. She said that there might be a need for a wetlands permit, Water Management Act permits from the State, 401 Water Quality Certification, Massachusetts Department of Environmental Protection (MADEP) involvement, 404 Army Corps, and CZM Consistency Review. She went on to say the need for these permits was dependent upon how these projects were looked at, in terms of CERCLA. This has not been clarified to date, and a number of permits would be needed before work could go forward. She stated that the issue of what portions, if any, of these various alternatives might come under the State exemption for work in a land and agriculture area was still possibly up for interpretation. She then asked how much of this work was being done for the land and agriculture. She commented that what was being expressed today was not a project that has commenced, because the cranberry growers were planning to do this project. These projects were being proposed because of a pollution source outside of the cranberries.

Ms. Balkus agreed that part of what should be included in the discussion this afternoon was the possibility of an arrangement that would allow the Towns and the growers to work cooperatively with the Air Force and implement some of the smaller actions in the smaller areas. For example, there are benefits of berming in LaSalle Bog from an agricultural point of view. She stated that she would like to establish a dialogue on the possibility of implementing that kind of cooperative arrangement.

Mr. McDermott stated that he was confused. He noted that earlier it was said that consensus would hopefully be reached by early this week, with construction to start in November to be completed by March. He stated that there was a serious question as to what was going on here. He remarked that this was going to take a long time. Ms. Balkus replied that it could potentially take a long time, but if the right players were in the right place at the right time, and there were mutual benefits to an alternative, then it is possible. She added that she had explained some of the other ongoing activities, such as the studies that were underway and the legislative compensation that were factors that also had to be taken into consideration. She stated that the timeframe that was mentioned was a goal to shoot for, but it was not the only alternative.

Ms. Kiley noted that with all of these different alternatives, there were a number of permitting constraints. She said that Ms. Balkus alluded to these constraints, depending on how this process would be moved forward. She then asked under what authority this work was being done. She also asked if there would be a resolution to that shortly. Ms. Balkus replied that she hoped so, but that she did not know the answer. She stated that by talking about the alternatives, it could be determined which ones may or may not require permitting.

West Thompson Bog:

Ms. Balkus reported that the West Thompson Bog had been non-detect in the surface water and was already separated from the river. She added that there were at least four different water sources that could be tapped into--the Falmouth water main, sites further up river, Round Pond, or EW-1 treated water. She stated that one advantage would be that the bog would be allowed to go back into production by 1999. She stated that an appropriate water source would have to be determined.

Ms. Balkus then referred to the options for Alternative E for the East Thompson Bog. She stated that Option #1 would include the realignment of the existing river channel and the installation of a berm on the inside of the river channel to separate the bog from the river. She stated that the river would then be able to flow freely, because currently there was a weir at the bottom of the East Thompson Bog that

controlled the flow north of it, and the realignment would allow for the weir to be taken out. She stated that a clean water source would also have to be provided for the bog operations in that area.

Ms. Balkus reviewed Option #2, which included leaving the river channel in place and installing a berm on the east side. Therefore, the smaller portion on the east side of the bog would be used for cranberry production, and the western side of the bog could be used as a wetland area. She clarified that there would be some loss of cranberry production, but there would not be an impact on the river. She stated that approximately one acre would be left for production, and two acres that would potentially be lost.

Mr. Field asked what was the cost of this alternative. Ms. Balkus replied that estimates were based on the installation of high points in an existing water body. She stated that the alternative water source for the Augusta, Adams, and LaSalle Bogs would cost approximately one hundred thousand dollars. She reported that the berm on the Adams Bog was approximately fifteen thousand dollars, and the berm on the LaSalle Bog would cost about the same. She stated that the costs were based on a cooperative effort with the Town and the growers.

Chaston Bog:

Ms. Balkus reported that the Chaston Bog was already separated from the river, but it was a leaking bog. Therefore the proposal was to provide an alternative water source to allow it to hold water when flooded.

Ms. Koulheras asked what the concern was if the bog was already separated from the river. Mr. Szymoniak replied that the concern was to provide water for harvest and flooding.

Ms. Kiley asked if there were any neighbor access issues. Ms. Balkus reported that during a site visit, a gentleman stated that his property had been disrupted during one of the other activities, and he pulled out a shotgun to ensure no one would access his property. She stated that any work would have to be done while working with the property owner to ensure that everything was understood.

Reservoir Bog:

Ms. Balkus stated that the goal was to control the concentrations upriver, so that by the time it reached Pond 14, the concentrations should be very low. She stated that the last bit of controls would be installed in Pond 14 to ensure that non-detect is reached. She noted that Pond 14 was an old abandoned cranberry bog. She stated that it was believed that there was a deep channel that ran through the center of the pond, and that the surface water was short-circuiting through the pond. The first step would be to run a tracer test to determine the actual detention time. The test results could determine which option would be appropriate.

Ms. Balkus reviewed the three options for the Reservoir Bog. She noted that Option #1 would include the installation of a floating baffle system that would force the surface water to navigate its way through the pond, and therefore increase the detention time of the water in the pond and thereby degrade part of the EDB. She explained that Option #2 proposed the installation of a new weir at the outfall to raise the water elevation in order to decrease the concentrations. She reported that Option #3 suggested that plant structures could be installed, which would serve the same purpose as the floating baffle system.

Mr. Montague expressed concern about disconnecting the connection between Flax Pond and Pond 14. He stated that there were times when the water needed to be channeled between Flax Pond and Pond 14 to allow the fish to get to Flax Pond. He said that issue should be explored. He commented that the connection was currently blocked off with sandbags to address the concerns about EDB travelling that way. He stated that the water would be needed at some point, and he would like to have that option, or

have water from another source. Ms. Balkus replied that there was concern about getting the fish into Flax Pond and to Pond 14. She noted that the flume would be increased coming out of Flax Pond, so that the Herring population would be encouraged to use Flax Pond.

Ms. Muramoto expressed concern about the floating baffles in Pond 14. She asked how deep and complex the structure would be, and what the impacts would be on the fish. Mr. Szymoniak replied that the floating baffles would be hung by wire rope and anchored to the shore. He stated that the baffles would be full depth down to the bottom. He explained that they were anchored on the bottom and would float on the water surface. He stated that the problem with the baffles were that they were not made for man-made natural ponds and were really constructed for use in lagoons.

Middle and Lower Bogs:

Ms. Balkus replied that the Middle and Lower Bogs were tied into what had already been discussed. She stated that whatever action was taken on Pond 14 would directly impact the Reservoir, Middle, and Lower Bogs. She stated that the Flax Pond bogs were currently cranberry producing and were being marketed.

Mr. Field asked what the cost was on the Reservoir Bog. Ms. Balkus replied that there was not a detailed cost available for the floating baffles.

Agenda Item 9. Summary of the Phased Approach:

Ms. Balkus explained that Phase I would consist of berming off the northern piece of the Baptiste Bog. She added that the alternative water source would be provided to the bogs that were already separated. She noted that a significant amount of bogs could be brought back into production quickly. She reported that Phase II would include the berm structure along the Adams and LaSalle Bogs and the inclusion of an alternative water source for the middle area. She also stated that one of the options for Pond 14 would be implemented to reduce concentrations. Ms. Balkus then referred to Phase III, which would address the East Thompson Bog. Phase IV referred back to the Lower Baptiste holding pond. She noted that since everything was contingent on what was done at the Lower Baptiste Bog, that perhaps that should be done first. She explained that it was dependent on what goal was trying to be met. She stated that she would like comments and feedback from the attendees on this matter.

Ms. Harper asked if the volume of flow that would be needed as an alternative source, whether it be from Round Pond or the Town water supply, had been calculated. Ms. Balkus replied that approximately 600 gpm had been estimated. She also mentioned that it took two to three days to be able to fill the bogs.

Mr. Field asked when the water would be needed. Ms. Balkus replied that all of the bogs needed to be flooded in the winter to prevent the vines from freezing. She stated that if the bog used wet harvesting, then there would be an additional need for flooding.

Ms. MacRae asked if the bogs would be flooded to prevent budding. Ms. Balkus replied that yes, the bogs would be flooded next year to prevent the buds. Mr. Szymoniak replied that with an alternative water source it was possible that the bogs could be back in production next year. He stated that data was available that suggested non-detect, with the exception of when water was provided for flooding. Mr. Field asked if there was enough water supply for the irrigation needs but not for the winter protection and wet harvest flooding. Ms. Balkus replied that was correct.

Ms. Selman commented that she heard that fifteen hundred gpm were needed, and that four to six hundred did not seem sensible. Mr. Szymoniak replied that fifteen hundred was used in the model, but it was thought that it could be done with less. Ms. Selman then asked how many gallons would be used from

Round Pond. Mr. Szymoniak replied that six hundred gpm was enough to feed the bogs. Ms. Selman asked how many bogs the water taken from Round Pond would feed. Mr. Szymoniak replied that one bog would be done at a time, and the total would be approximately twelve acres.

Mr. Field asked if six hundred gpm would supply all of the bogs with water for both winter protection and harvest. Mr. Szymoniak replied that the bogs could not all be done at the same time, because six hundred gpm would not do all of the bogs at once. He stated that it would have to be phased in off of the pipeline. He noted that the assumption was that the bogs did not leak.

Ms. Selman commented that it had taken three years to get the water level back up at Round Pond. She expressed concern about the wildlife. Mr. Szymoniak replied that there was a withdrawal going out to Jenkins Pond, which could be used for the bog instead of going into Jenkins Pond. Ms. Shea asked Mr. Szymoniak if he was referring to the stream that ran under the road. Mr. Szymoniak replied that he was and pointed out that he had not yet looked at it. Ms. Shea commented that that stream was dry for about ten years and had only opened up since last fall. She stated that it was only because of the rainfall that it started to flow again.

Mr. Bicki commented that in terms of the water use, the actual withdrawals could be considerably less, because there could be some sharing of harvest water, for example, from the Augusta Bog to the West Thompson piece. He stated that there was a weir that connected those two pieces. He commented that a weir between the Chaston Bog or the LaSalle Bog would be a small price to pay to be able to transfer some of the harvest water or floodwater from one piece to the other. Mr. Bicki stated that the growers could coordinate the sharing of that water.

Mr. Koehler asked how much the pipeline from the Augusta Bog to Turner Road would cost. Mr. Szymoniak replied that the cost would be approximately twenty dollars per linear foot. He added that the most pipeline that would be used was three thousand feet. Mr. Koehler commented that sounded inexpensive. He then asked how long it took to cover the cranberry plants in the winter. A cranberry grower replied that it depended greatly on the timing of the cold front.

Ms. Muramoto asked in regard to withdrawing water form another pond and feeding a new source, if creating a storage area for treated EW-1 water to be used as an alternative water source had been considered. Ms. Balkus noted that was good idea. She said that it had been considered and would have to be discussed with the landowner.

Ms. Kiley stated that there had been discussion about piping down treated water, and discussion about piping down water upgradient of the treatment. She then asked if, for example, what was in the Coonamessett River would be piped down from north of Station 6, so clean water would be piped down for flooding. Ms. Balkus stated that was still being considered. Mr. Szymoniak mentioned that there was concern about the impact to the fish.

Ms. Kiley commented that the discussion was about flooding for the winter, which typically would be taking place in December, and once the bogs were flooded, they would be flooded through March or so. Mr. LaFleur clarified that the bogs would be flooded, depending on the oxygen level in the water. Mr. Szymoniak suggested to keep in mind that the water table was high this year.

Ms. Valiela commented that moving water from any pond to this area was going to have significant barriers. She said that there would be a public acceptance barrier, there was a greater than 100 gpm permitting issue, and there might be a strong wetlands issue. She remarked that it would be much more promising to consider using the treated water from EW-1. She noted that the production there was as high as 800 gpm. She said that there was discussion about one possibility being the shallow well points.

She then commented that there had not yet been discussion about whether there was treated water coming from any other plants on base. She said that in terms of treated water, that was another possible candidate. She went on to say that 600 gpm pulled out of either Round Pond or Coonamessett Pond would not match the need. She stated that other answers needed to be developed that had the entire solution and did not have all the environmental and neighborhood concerns with taking the water out of a pond.

Ms. MacRae stated that it was her understanding that EW-1 captured eighty percent. She then said that the letter that Ocean Spray wrote stated that they would not take any cranberries until the river was one hundred percent free of EDB. Mr. Szymoniak replied that the concern was what to do with the main portion that had not been captured. Ms. MacRae commented that the treated water would still only be eighty percent clean. Mr. Szymoniak stated that the treatment plant removed one hundred percent of the EDB.

Mr. Jasinski noted that fifty percent of the bogs of concern were in the lower half, in the second half of the phased approach. He then asked why bringing those fifty percent of bogs back into operation as quickly as possible was not the focus of this approach. Then the other bogs, the Adams, LaSalle and East Thompson Bogs could be addressed as the process moved ahead. Ms Balkus replied that it was interconnected right now and that the contamination had to be addressed upstream. Mr. Jasinski asked what was the most important thing to do to fix those fifty percent of bogs. Ms. Balkus replied that other alternatives could also be used. She explained that part of an alternative could be used, and the bogs could be bermed off. She stated that she presented a broad cross-section in hopes of some feedback. Mr. Szymoniak stated that it had already been demonstrated that non-detect could be reached, if the contamination were cut off upstream. He explained that the goal was to reduce the concentration upstream by either flooding the bogs or controlling the upwelling. He stated that the first thing that had to be done at Pond 14 was to complete the tracer that Ms. Balkus had mentioned.

Ms. Miles agreed that there was a need to reduce concentration upstream, and therefore it would seem that the first step would be to create the Lower Baptiste holding pond to reduce those concentrations upstream, before doing the berming of the small bogs. She stated that those thirty acres of the lower bogs could then be brought much more quickly, and more focus could be put on the smaller bogs. Mr. Szymoniak agreed that it might be more beneficial to do the Baptiste Bog first.

Mr. Szymoniak stated that the concentrations coming out of Pond 14 were barely detectable. He stated that an understanding of what was taking place upstream was necessary, as was an understanding of what was happening at Pond 14.

Ms. Selman asked if each bog could be "self sufficient", by using a small well with a carbon filter to recycle the water used for flooding. Mr. Szymoniak replied that the bogs were currently designed that way. He noted that the Augusta Bog has a return reservoir, which was used for irrigation. Ms. Selman asked why then was this was not done. Mr. Szymoniak replied that the bogs were interconnected because they relied on the river, and the gradients were now very flat in the upper bogs. He stated that without attempting a lot of re-grading, the bogs would remain somewhat interconnected. Mr. Szymoniak stated that the bogs could be separated, as Ms. Selman had indicated, however, a lot of withdrawal for a short time period would be needed in order to flood the bogs this way. Ms. Selman noted that this could be done with the reclaim water from the river. Mr. Szymoniak stated that there were areas where a return reservoir could be built. Ms. Selman recommended using a holding tank. Mr. Szymoniak stated that for every acre of bog, two feet of water would be necessary to cover and protect the vines. Mr. Spear added that approximately 325,000 gallons per acre foot would be required.

Ms. Selman understood that a well with a carbon treatment head would be expensive, however, she felt that it would eliminate all the "ifs, ands, or buts". She explained that each area would be treated with its own well with a carbon head and recirculatory system. Mr. Szymoniak replied that Alternative C pumped and treated the water. He stated that Ms. Selman was suggesting having each individual bog be self-sufficient. Ms. Selman agreed. Mr. Szymoniak stated that was an option. He stated however, that the cost of the berries would not warrant the operation and maintenance of that kind of facility.

A member of the audience noted that it had been said that it took two acres of water to flood one acre of bog. He asked how one could consider using Round Pond, at 12 acres, to flood 13 acres of bog. Mr. Szymoniak replied that it would not be done at one time. He then asked Mr. LaFleur how much time was required to flood the bogs. Mr. LaFleur asked the group to consider which option was the best one to clean the plume, as well as potentially service the bogs, given that the ultimate objective was to clean up the plume.

Ms. Balkus reminded the attendees that there was an ongoing CERCLA Superfund RI/FS that would address how to cleanup the entire site, including the groundwater, the surface water and any air impacts. She stated that this project attempted to minimize any health risks associated with the cranberry workers, and consider the possibilities of bringing the cranberry bogs back into operation. She noted that although it may best serve the bogs by cleaning up portions of the plume, that was not the goal of this part of the effort. Ms. Balkus then re-phrased Mr. LaFleur's question and asked the group to consider which alternative or combination of alternatives that had been reviewed would best remedy the interests of the group.

Agenda Item 10. Question and Answer Discussion:

Mr. McDermott remarked that it did not make sense to keep the bogs in operation. He noted that if the bogs were taken out of operation, over ten years there would be $7.5 million available to buy out people's property rights by way of negative easement or fee interest. There would be a $100,000 cost per year to operate EW-1, which would remove 80% of the EDB. Mr. McDermott stated that the town would benefit by having a natural river; fishing would be improved, and recreation would be improved. He stated that a lot of money would not be spent on the basis of assumptions, possibilities, hopes, anticipations and expectations that may or may not come about.

Mr. Handy noted that he could not accept Mr. McDermott's viewpoint. He said that as a fifth-generation cranberry grower, he was proud of the work that had been done on the town bogs, and he had a big problem with the idea of just throwing the bogs away. He stated that he preferred the wellfield design treatment. Mr. Handy said that if he had to sacrifice the East Thompson and the Lower Baptiste bogs to get the others back on, then this was the "way to go." Mr. Handy also remarked that it was time to coordinate with the regulatory agencies, in order to get past the permitting issues, if there were any. He noted that it was not a position that the town, the military, he, or anyone in the room would want to be in. Mr. Handy felt that it was possible to get beyond this EDB issue and noted that throwing up these potential roadblocks did not serve anybody.

Ms. Kiley noted that it was her understanding that a recommendation had been made to postpone next week's meeting for a week, in order to allow more time for public feedback. She said that it would be helpful to clarify this timeframe. Mr. Field agreed that it was important to discuss the next steps before the meeting adjourned, however he suggested that general comments be heard first.

Mr. Costa commented with regard to permitting, that if there were not any broad Superfund exemptions, it would be very challenging to meet the deadlines being discussed. He said that there would have to be a tremendous amount of coordination between the agencies on the permitting issue. Mr. Costa commented

that the point of the permitting process was to fine-tune the projects in an attempt to correct any unanticipated adverse impacts and to get "the best bang for your buck."

Mr. Costa also noted that prior to the discovery of EDB in the plumes, the Buzzards Bay Project had been working with the Conservation Commission's cranberry bog subcommittee to address pesticide management in the flow-through bogs. He said that these bogs represented a minority of bogs in Massachusetts, and it was difficult to keep the pesticides out of the stream. He reported that a proposal was developed and funding was received to separate the bogs from the river system. Mr. Costa said that some of the pictures being shown today were similar to those ideas discussed. He stated that it was his hope that the long-term objective was not only to continue these cranberry bogs, but to also look for opportunities to address pesticide management.

Ms. Valiela announced that tomorrow it would be known whether the Town of Falmouth would hold a special meeting with the Conservation Commission next Wednesday to focus on the alternatives, or the pieces of the alternatives, that were believed to work best for this community.

Ms. Valiela noted that moving water from any pond into the Coonamessett River system was not a good idea. She said that purchasing water from the Town was also not a good idea. Ms. Valiela stated, however, that treated water and additional irrigation wells were possibilities that should be considered. She said that berming along the river stretches would have multiple benefits, including the protection of the worker, assistance to the fisheries in their propagation efforts, and addressing the pesticide issue.

Ms. Valiela agreed with Mr. Handy that the shallow well points added to the treatment issue, along with EW-1, and may also figure better into how to actually keep the EDB from getting downriver. That would thereby free up the lower 50 percent of the bogs, which could come back into production fairly soon.

Ms. Valiela also noted that she recognized the permitting issues. She said that if the town could come to an articulated consensus on the best pieces of the alternatives, it would lay out the course of which pieces would and would not need permitting. Ms. Valiela stated that once it was determined which pieces needed permitting, then it would be necessary to get the "permitting folks" in the room to discuss and accelerate the permitting process. She felt that this effort was important.

Ms. Miles noted that this was not a statement of preference, but rather a question to Ms. Balkus. She then referred to Alternative A and stated that this alternative was very dependent on obtaining years of additional compensation through legislation with Congress, which was very hypothetical. She asked, if there were clear consensus over the next few weeks that this was the preferred alternative, was the Air Force really prepared to choose this alternative. She asked if this was a realistic alternative. Ms. Balkus replied that it was a realistic alternative, and it needed to be evaluated fairly. She commented that everyone's participation was needed to say as a stakeholder community that there was agreement that this was the best alternative. She questioned the success of the Air Force going to Congress and saying that Alternative A was the right approach. Ms. Balkus went on to say that it may be more successful if the local citizens, the local town, and the regulatory agencies all went to their respective congressional participants.

Mr. Field summarized that if there was broader support for whatever alternative was chosen, support for funding was more likely. Ms. Balkus stated that was correct.

Mr. Spear asked if Alternative C, the shallow wells, achieved the same level of cleanliness as Alternative B, the channel alignments and sump areas. Mr. Szymoniak replied that non-detect would be achieved with Alternative C, due to the active treatment. Mr. Spear noted that this alternative would come at a lot

more dollars and complexity. Mr. Szymoniak agreed that this was more complex because it dealt with shallow groundwater.

Mr. Montague remarked in regard for the fisheries, that if the bogs in the river system were not going to be taken out of production in Alternative A, then he had a strong preference for Alternative D, which separated the bogs as much as possible from the river system.

Mr. Field summarized the broader issues, which were: the source of the alternative water, the importance of public input, the permitting issue, funding options, and costs of each of the alternatives. He noted that there was strong opposition to pumping alternative water from a pond. Mr. Field added that there were questions regarding the phasing in Alternative E and the buy out option.

Mr. Field listed the different opinions expressed:

- Although a buy-out would not help the cranberry industry, it would reduce uncertainty and provide an environmental benefit.
- The cranberry issue was important, and the bogs should be maintained in working order.
- Consider solving the EDB problem, the pesticide problem and fishery problem.
- Strong opposition to using water from Round pond.
- Berming
- In regard to the phased approach, consider the 50 percent lower bogs first.
- Consider permitting issues.
- Separate the bogs and the rivers to take care of the fisheries.

Ms. Koulheras noted that the outstanding issue of the lawyers coming to some conclusion on the CERCLA issue had been "blowing in the wind" for several months now. Mr. Field agreed that the question of the Air Force's legal position on how this activity could be conducted and under what legal authority, was a major and lingering issue.

Mr. Costa noted the importance of determining what categories of additional information the regulators or town officials needed in order to evaluate the various options.

Ms. Valiela mentioned the tracer test and asked about the status of the test for Pond 14. Mr. Szymoniak replied that a workplan would be written and submitted to the regulatory agencies and the Falmouth Conservation Commission, to make sure it was acceptable to conduct the tracer test.

Mr. Braun remarked that it may be helpful to provide a spreadsheet summary of numbers relating to the various alternatives and their cost, in order to make these numbers more readily accessible.

A member of the audience asked if the shallow well points would clean up the river. Mr. Szymoniak replied that it would depend on how many well points were installed. The audience member then asked how many well points would be needed at 200 gallons per minute (gpm). Mr. Szymoniak replied that the pilot test would be run at 400 gpm. He stated that it depended on how many well points were put in where the concentration was upwelling. He stated that he pilot test was designed to determine that.

Ms. Muramoto noted that it would be nice to have a matrix summary of the differences and similarities between the different options. She stated that the following items should be included: water budget, the area of bogs involved, the amount of fill required, and the area of natural wetlands versus already altered areas.

Ms. Harper said that it would be helpful to know which pieces of the alternatives would be implemented and incorporated into other alternatives.

Mr. Field asked the group if it was comfortable with the following "next steps": the Town of Falmouth would meet to discuss the issues, and there would then be a follow-up meeting to focus on an alternative.

Mr. Gordon remarked that it was clear that the Town of Falmouth would not have an answer by next Wednesday, and therefore it did not make sense to schedule a meeting for that day. Ms. Balkus noted that the Senior Management Board (SMB) and Management Review Group (MRG) would be meeting on September 22, 1998 and the Executive Review Group (ERG) would be meeting on September 24, 1998. She said that those were target dates for her senior management to try to make decisions on how to proceed. She recommended either meeting at the end of next week or the beginning of the following week, rather than waiting until another Wednesday.

Ms. Valiela noted that next Wednesday's meeting was essential to the Town of Falmouth in terms of coming to a more focused position. Ms. Balkus noted that there would be a morning meeting for Mashpee (8:00 A.M. – 11:30 A.M) and an afternoon meeting for Falmouth (1:30 P.M. to 4:30 P.M.). After further discussion among the group, a decision was made that the next meeting would take place on Monday, September 21, 1998 at Christ the King Church in Mashpee.

Ms. Balkus thanked everyone for participating.

Agenda Item 11. Adjourn:

Mr. Field adjourned the meeting at 3:17 P.M.

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MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

FS-28
Coonamessett River Stakeholder Summit

9 September 1998

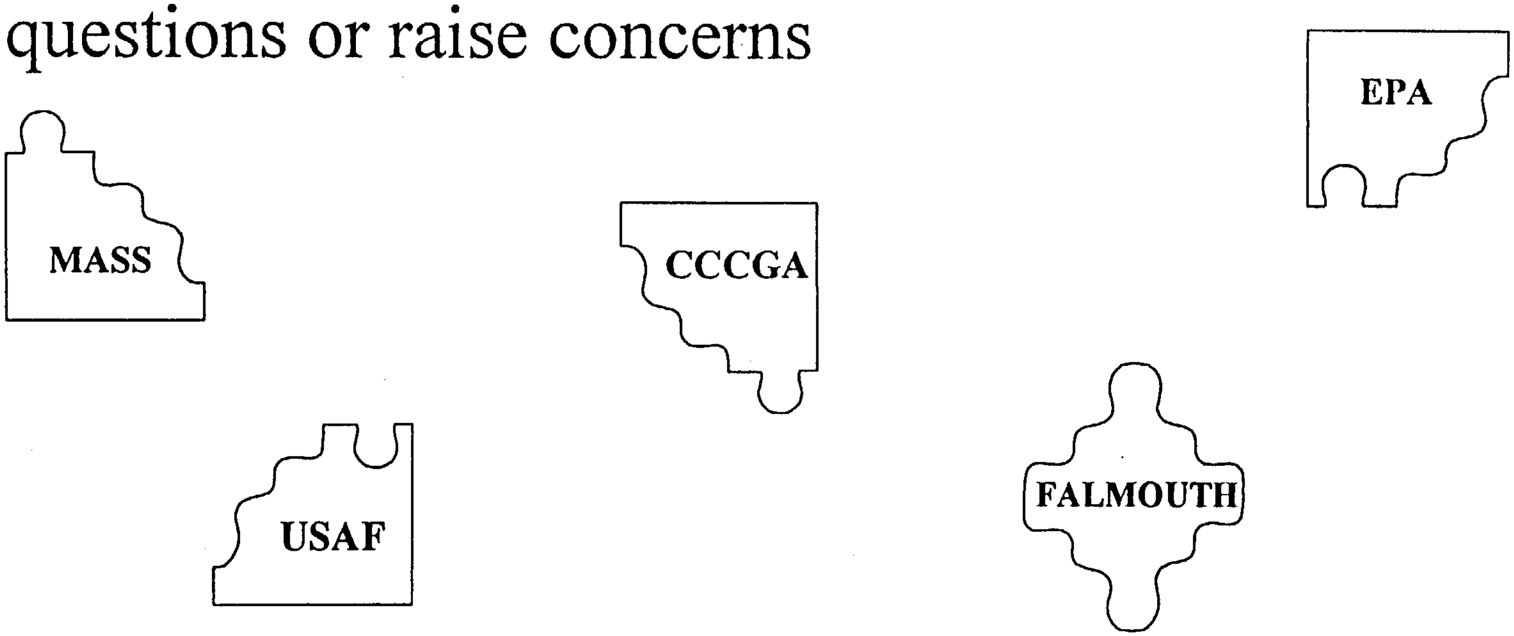
Presented by: Nancy Balkus

MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

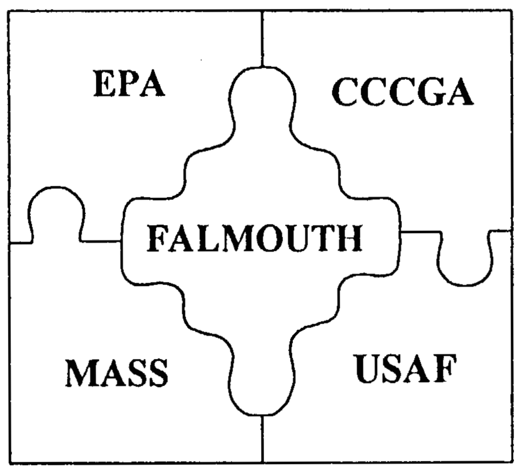
Purpose of Stakeholder Summit

- Present potential alternatives being considered for the Coonamessett River EDB Response Plan
- Provide an opportunity for stakeholders to ask questions or raise concerns



Goals of Stakeholder Summit

- To determine which alternative best resolves the EDB problem and meets the community's needs
- To reach consensus agreement on a preferred alternative at the 16 Sep 98 meeting



Installation Restoration Program

MASSACHUSETTS MILITARY RESERVATION

MMR Cranberry Stakeholders

TOWN SELECT/POLITICAL APPT.

- Nancy Caffyn, Select - Town of Mashpee, 508-477-0026
- Bob Whritenour, Exec. Sec. Town of Mashpee, 508-539-1400, x-510
- Virginia Valiela, Select - Town of Falmouth, hm 508-563-6028
- Peter Boyer, Falmouth Town Administrator, 508-548-7611
- Elizabeth (Betsy) McElvey, Sen Kerry's Office, 617-565-8264
- Steve Kerrigan, Sen Kennedy's Office, 617-565-4474
- Mark Forest, Rep Delahunt's Office, 508-771-0666
- Jim Quin, Foothill Engineering, 303-278-0622, x-119
- Everyone Deserves Better, EDB Neighborhood Coalition
- Gail MacRae/Brian McDermott, Homeowner/Attorney

CONSERVATION COMMISSIONS

- Bob Sherman, Mashpee Conservation Commission, 508-539-1400, x-539 (Sec'y 540)
- Diane Boretos, Mashpee Conservation Commission, 508-539-1400, x-539
- Jo Ann Muramoto, Falmouth Conservation Commission, 508-548-7611, x-265
- Allan Gordon, Chair Bog Cmte, Falmouth Conservation Commision, 508-289-2482
- Paul Montague, Falmouth Shellfish/Herring Constable, 508-457-2563
- Mark Patton, Falmouth Natural Resources, 508-457-2536
- Tom Cambareri, Cape Cod Commission, 508-362-3828
- David Patter, Chairman, Falmouth Conservation Comm.
- Ray Jack, Water District Superintendent, Falmouth Water District
- Dana Smith/Tina Dolan, The 300 Committee, Land Acquisition
- Bruce Tripp, Bog Subcommittee, Coastal Research Lab, 508-289-2900

CRANBERRY INDUSTRY

- Jeff LaFleur, Cape Cod Cranberry Growers Assoc., 508-295-4895, x-11
- Emily Sperling, Cape Cod Cranberry Growers Assoc., 508-295-4895, x-13
- Brian Handy, Handy Cranberry Trust, 508-564-4370
- Dan Augusta, Cranberry Grower, 508-548-5565
- Tom Adams, Cranberry Grower, 508-540-3626
- Bill Chaston, Cranberry Grower, 508-540-1424
- Tony & Marina Andrews, Andrews Farm, 508-548-4717
- William Franz/Dr. Tom Bicki, Ocean Spray, 508-946-7476/7128/fax 7684
- Tom Bewick/Frank Caruso, Cranberry Experimental Station, 508-295-2212, x-18

STATE

- George Crombie, Mass. Exec. Office of Env. Affairs, 617-727-9800, x-222
- Paul Taurasi, MDEP, 508-946-2712
- Len Pinaud, MDEP RPM, 508-946-2871
- Cathy Kiley, MDEP, 508-946-2830
- Marcel Belaitz, MDEP, 508-946-2866
- Elizabeth Kouloheras, MDEP Wetlands, 508-946-2819
- Suzanne Condon/Elaine Krueger, MDPH, 617-624-5757
- Greg Braun, MDPM, 508-968-4950
- Julianne Nassif, Director, State Laboratory Institute, 617-983-6661
- Steve Hurley, MA Div of Fisheries & Wildlife, 508-759-3406
- Ken Reback, MA Div. of Marine Fisheries, 508-563-1779, x-104
- Joel Lerner, EOEA, Leasing Attorney
- Jay Healy, Food & Agriculture Commissioner, 617-727-3000, x-100
- Joe Costa, Buzzard Bay Project, 508-291-3625

FEDERAL

- Frank Ciavattieri, EPA, 617-573-5704
- Mary Sanderson, EPA, 617-573-5711
- Paul Marchessault, EPA RPM, 617-573-5793
- Mike Jasinski, EPA (Alt. RPM), 617-573-5786
- Bob Lim, EPA, 617-223-5521
- Matt Schweisberg, EPA-OEP (Wetlands), 617-565-4431
- Steve DiMattei, EPA, 781-860-4369
- Jean Miles, EPA Attorney, 617-565-3699
- Dave Pincumbe, EPA-OEP (NPDES), 617-565-4429
- Dick Willey, EPA, 617-573-5635
- Don Liptak, USDA-NRCS, 508-771-6476
- Steve Spear, USDA-NRCS, 508-771-6476
- Nora Conlon, EPA, 781-860-4336

MMR

- Col John Selstrom, AFCEE/ER, 210-536-3383
- Lt Col Jim Lyon, AFCEE/ERD, 210-536-5291
- Jim Snyder, RPM, 508-968-4670, x-5612
- Mike Minior, Deputy RPM, 508-968-4670, x-4672
- Bud Hoda, FS-1 Project Manager, 508-968-4670, x-4618
- Marty Aker, FS-28 Project Manager, 508-968-4670, x-4671
- Dr. Andy Anders, AFCEE/ERC, 210-536-5567
- Carl Pavetto, Joint Program Office, 508-968-5624, 5936, 4642
- Lt Col Barbara Larcom, Joint Program Office, 508-968-5824, 5936, 4642
- Nancy J. Balkus, Cranberry Project Coordinator, 508-968-4670, x-4676
- Tom Szymoniak, Jacobs Engineering, 508-564-5746, x-316
- Donald Schall, ENSR/Jacobs, 508-888-3900
- Matt Gamache, Research Student, Western Polytechnical Institute, 508-793-1916
- Tara King, Research Student, Western Polytechnical Institute, 508-752-0564
- Lt Col Brian Miller, AF/ILEVR, 703-602-0222
- Johnny Davis, AF/ILEVR, 703-602-0767
- Col Sam Rupe/Jay McCain, AFLSA/JACE, 703-696-9156/9061, DSN 426
- Fred Kuhn/Larry Grener, GCN, 703-693-7312, DSN 223
- Bill Dick, AFCEE/JA, 210-536-4061
- William E. Edwards, SAF/Air Force Real Estate Agency, 202-767-4103, DSN 297
- Julie Talbot, AFREA, 202-767-4193, DSN 297
- Joanne Watson, Army Reserve National Guard, 410-436-1504, DSN 584
- Dave Hill, Army Reserve Nat'l Guard/Bregmar, 508-968-4909
- Ray Cottengaim, COE Real Estate, 508-968-4670, x-4644
- Mary Dunn, Corps of Engineers Appraiser, 978-318-8686
- Mark Escobar, UNITEC, 210-536-6310
- Shari Fritz, UNITEC, 210-536-6310
- Patrick Field, The Consensus Building Institute, Inc., 617-492-1414, x-18

Installation Restoration Program

MASSACHUSETTS MILITARY RESERVATION

Stakeholder Issues

FALMOUTH
- Schedule must consider cranberry and fishery seasons
- On-Going Maintenance of Bogs
- Long-term Benefit of Separating Bogs
- Ecological Impacts - flow, turbidity, erosion, turbulence, dissolved oxygen
- Ponding, Water Retention Impacts
- Vernal Pool and Natural Wetland Impacts
- Flood Storage
- Effects on Abutters
- Air Quality
- Pesticides
- Clean Water Supply for Bogs
- Future Use as Bogs/Wetlands

CRANBERRY GROWERS
- Work with Towns and Growers
- Want Win-Win for Everyone
- On-Going Maintenance of Bogs
- Communication - Want Updates
- Clean Water Supply for Bogs

COMMONWEALTH
- On-Going Maintenance of Bogs
- Vernal Pools and Natural Wetlands
- Herring Runs and Brook Trout Habitat
- Treated Water Discharge
- Ponding Impacts
- Construction Impacts
- Want Active Treatment
- Air Quality
- Flood Storage
- Impacts or Rare Species
- Hydrological Balance
- Mitigation
- Long-term Outcome
- Timing of Construction Season - Herring Run - Spring, Trout Spawn in Fall
- Fish Health
- Loss of Cranberry Acreage
- Permitting Requirements
- Legal Authority

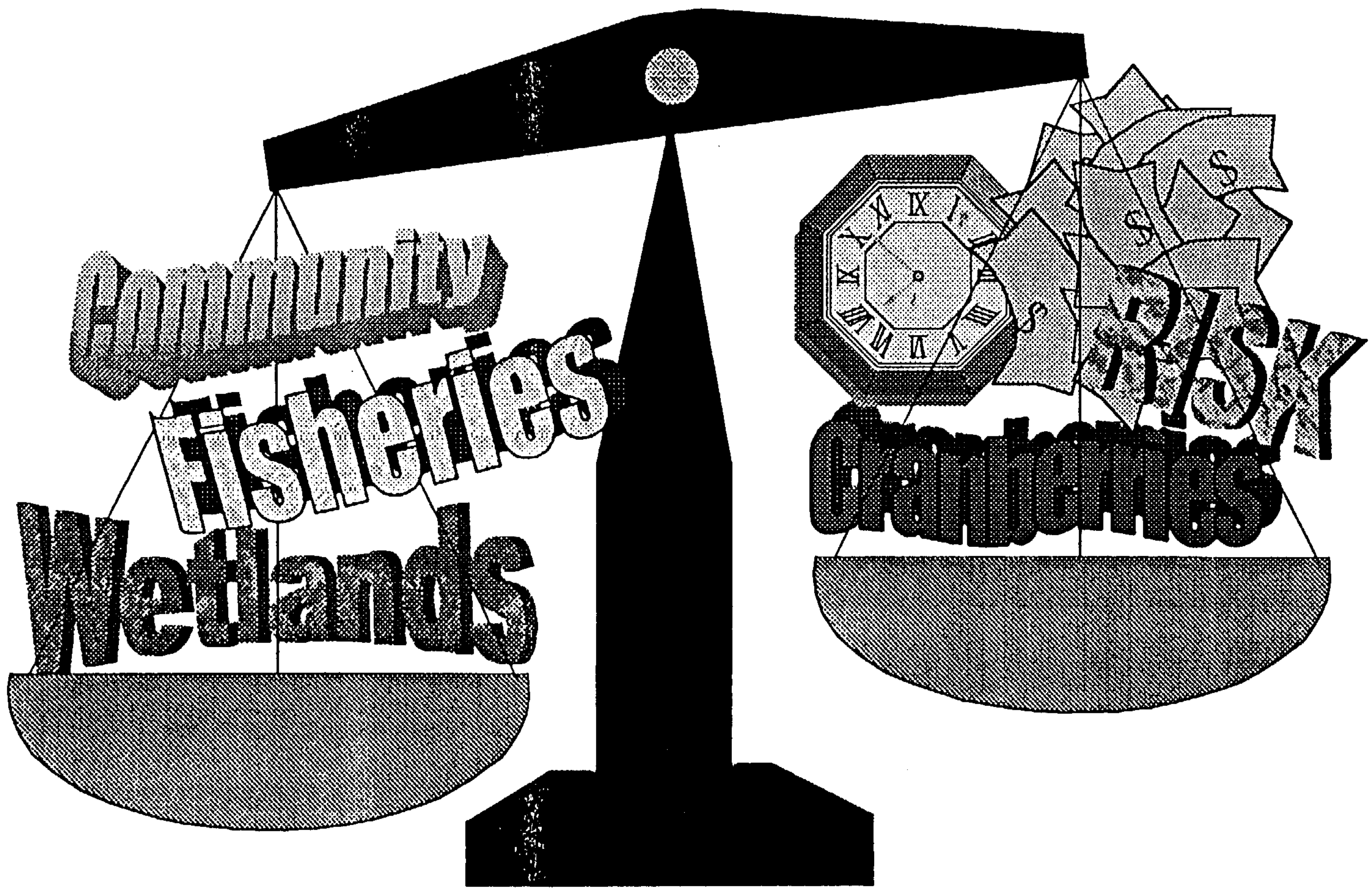
EPA
- Alternatives Analysis
- Plume Characterization
- Impacts on Aquatic Habitat
- Meet Water Quality Standards
- Long-term Effects
- Contingency Plan
- Permits
- Legal Authority

MMR
- Get out of the cranberry business by 2000
- Be protective of human health and the environment
- Cost effective/timely response
- Win-Win for Everyone

MMR
MASSACHUSETTS
MILITARY RESERVATION

Installation Restoration Program

Balance Competing Interests



MMR
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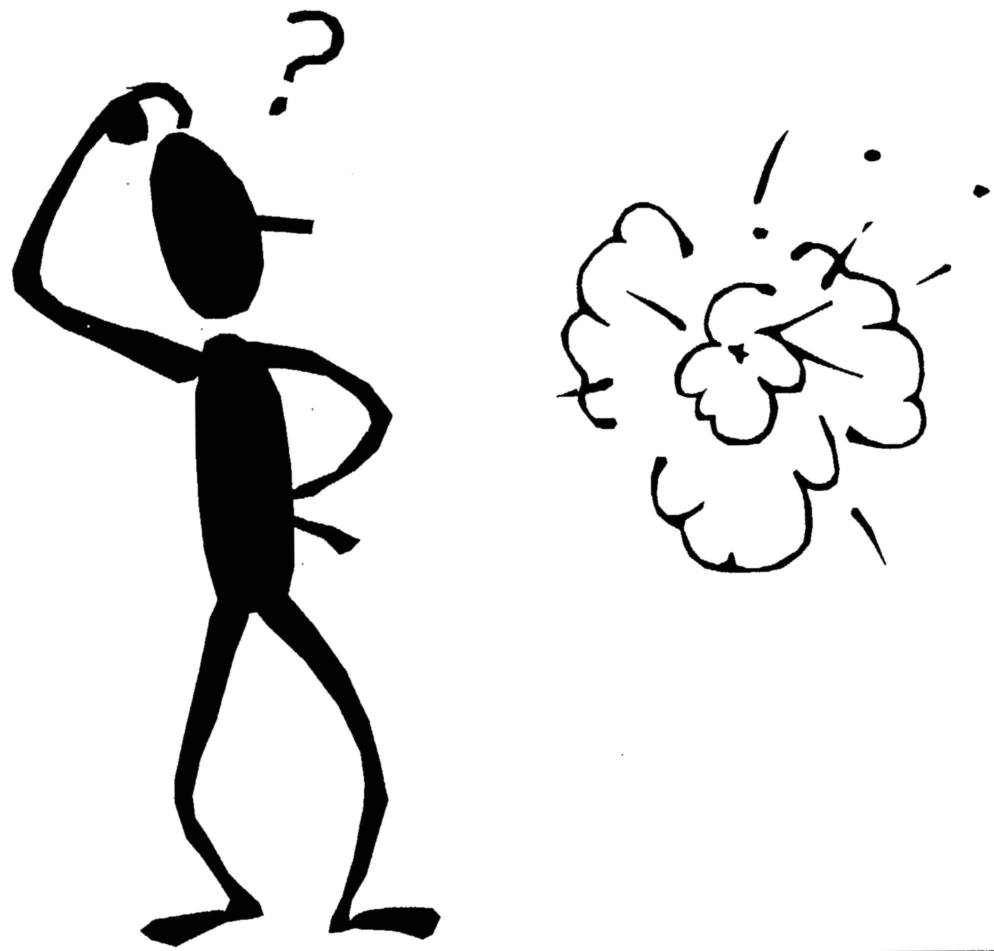
MILITARY RESERVATION

Installation Restoration Program

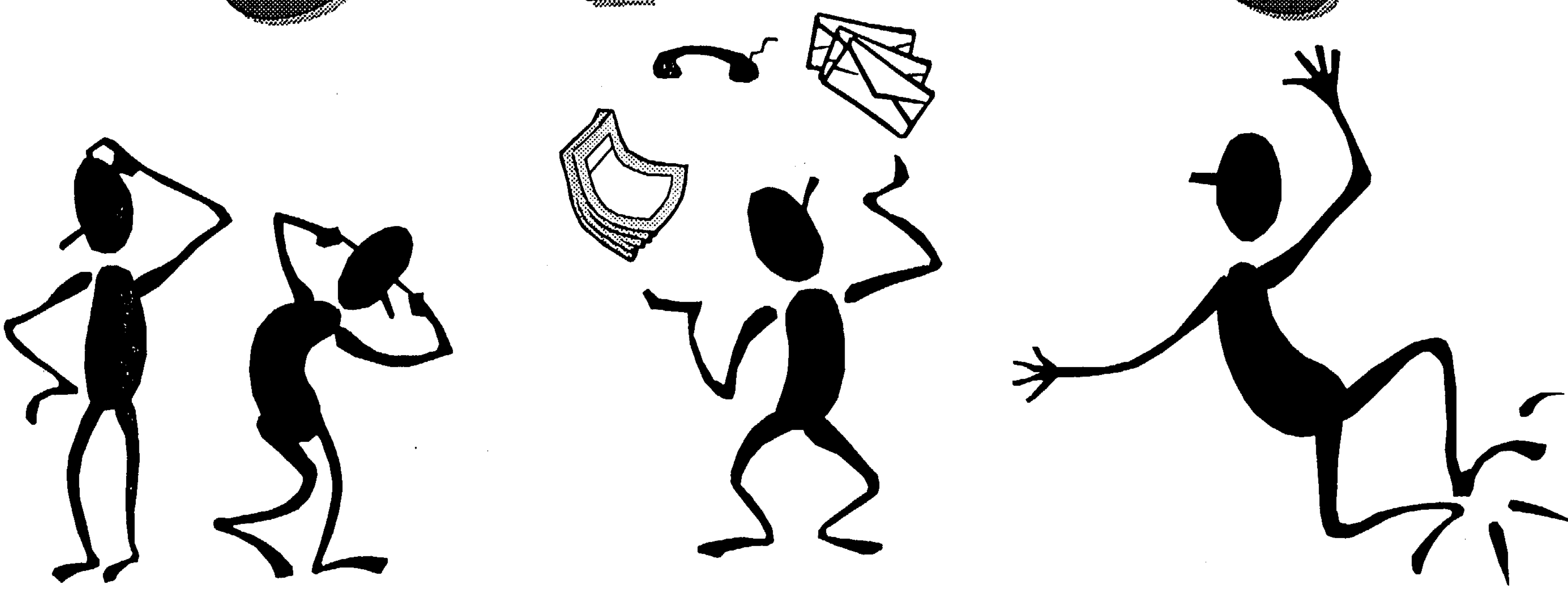
Where Do We Go From Here?



MMR MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

3 Options



Ignore It, Pretend It Will Go Away

Gather More Information, Keep Evaluating New Ideas

Reach a Compromise and Implement It ASAP

FS-28 Past Actions

- Private well sampling and bottled water distribution
- Connect Private Wells to Public Water Supply
  - Hatchville Road: 128 Residences, ECD Sep 98
  - Cloverfield Way: 37 Residences, ECD Dec 98
- Provided well-head protection for Coonamessett Supply Well
  - Falmouth water supply well is filtered with a granular activated carbon system
- FS-28 Extraction Well #1 (EW-1) Interim Action
  - Installed Sep 97; Intercepting majority of the plume
  - Model estimates surface water concentrations will achieve Non-Detect in 5-7 Years
  - Installed diffuser manifold to increase Coonamessett dissolved oxygen content
    - Increased from 2-3 mg to 6-10 mg.
- Alternate Irrigation Supply
  - Total of 12 irrigation wells installed

MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

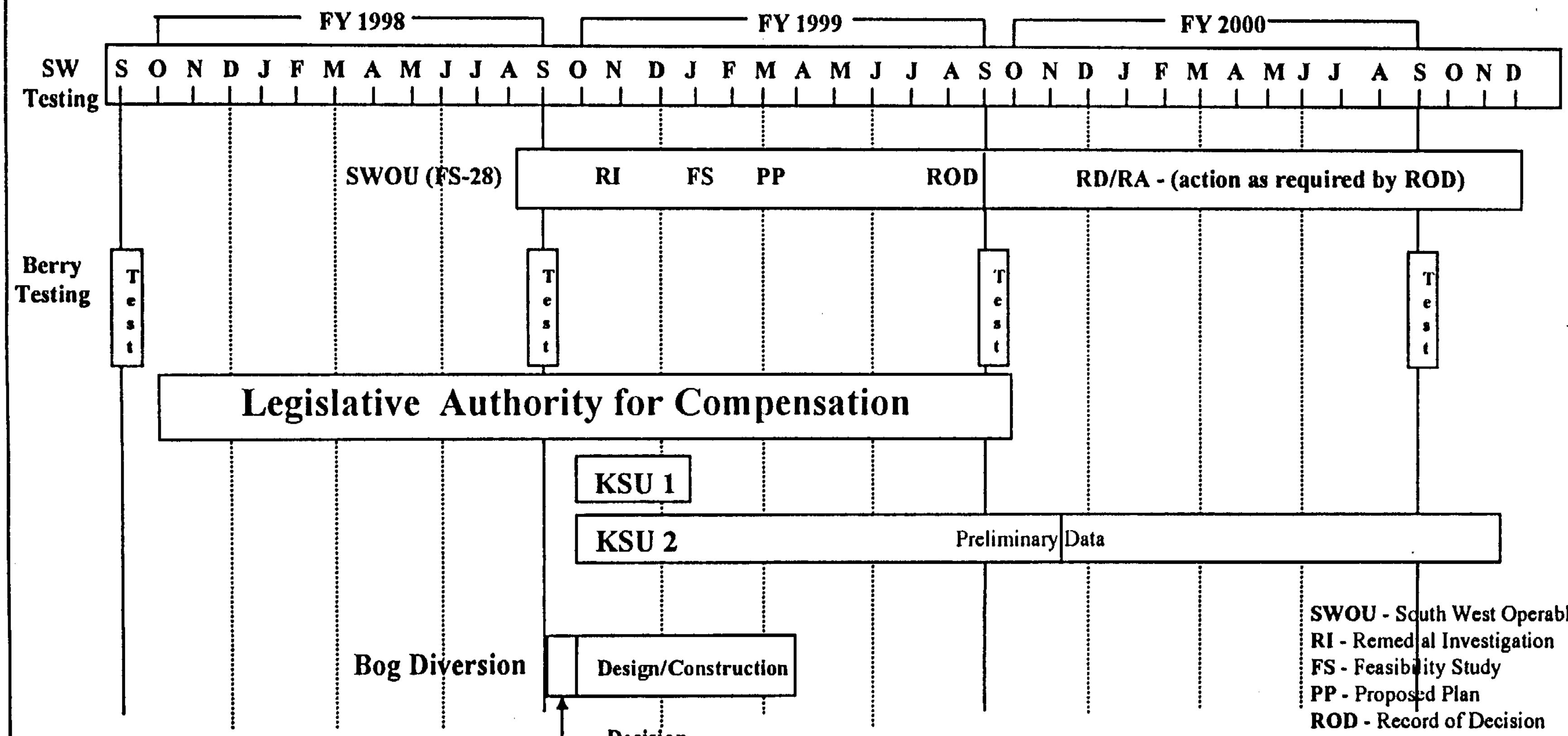
FS-28 On-Going Efforts

- **Compensation**
  - Negotiate negative easement agreement
  - Obligate funds NLT 30 Sep 98
  - Payments made between Oct-Dec 98 and Oct-Dec 99 based on grower's tax year
- **Cranberry Protocol & Testing**
  - Meets Food and Drug Methodology for food safety
  - Cranberry Testing planned for Mid- Sep 98
- **Surface Water Sampling**
  - Primary purpose: Manage human health risk
  - Conducted monthly at inflow and outflow of each bog
- **Remedial Investigation FS-28 (South West Operable Unit - SWOU)**
  - Draft Remedial Investigation Report 29 Oct 98
- **KSU Studies**
  - Can EDB penetrate the skin of the berry, and into the fruit? Estimated completion date - Jan 99
  - Can vines/roots of plant uptake EDB? Estimated completion date - Nov/Dec 00
- **Bog/River Diversion Concept Development**

MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

FS-28 Timeline



SWOU - South West Operable Unit
RI - Remedial Investigation
FS - Feasibility Study
PP - Proposed Plan
ROD - Record of Decision
RD - Remedial Design
RA - Remedial Action

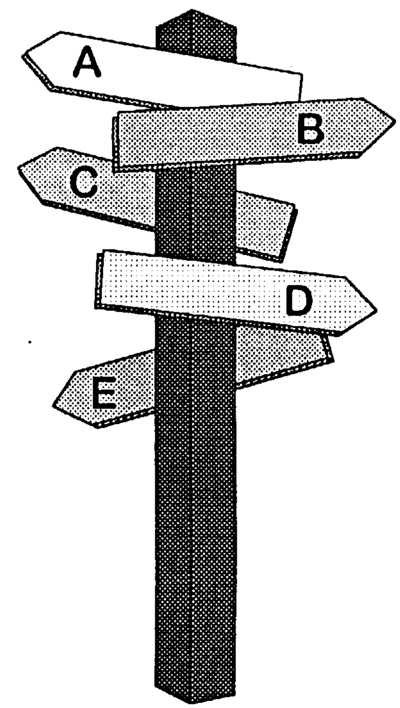
Surface Water Sampling Monthly | Cranberry Testing | FS-28 Reports | Kansas State University (KSU) Research Studies

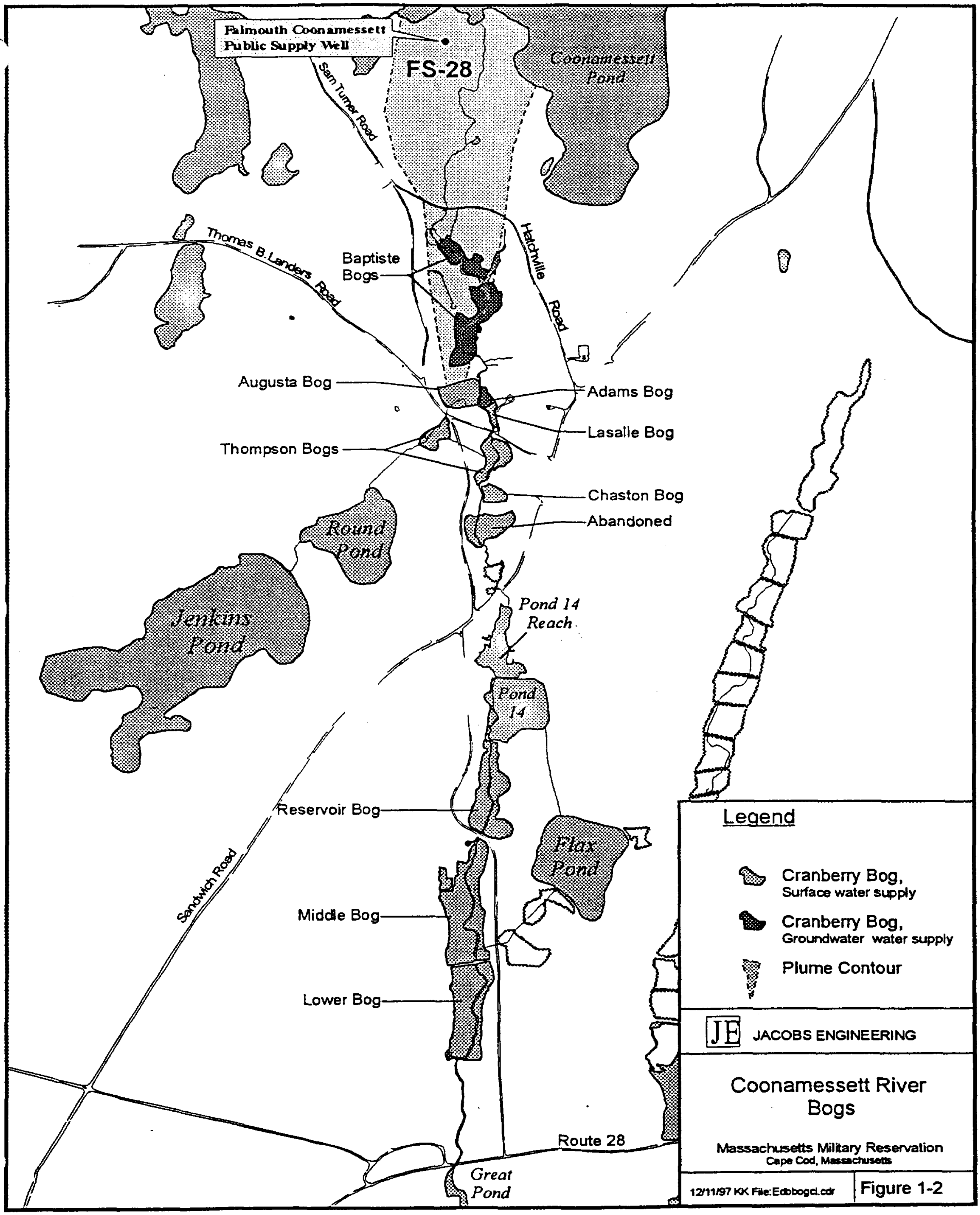
MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

FS-28 Decision Schedule

- 9 Sep - FS-28 Stakeholder Summit Meeting
- 16 Sep - Consensus Decision Meeting
  - 1-4 PM - Otis Golf Course

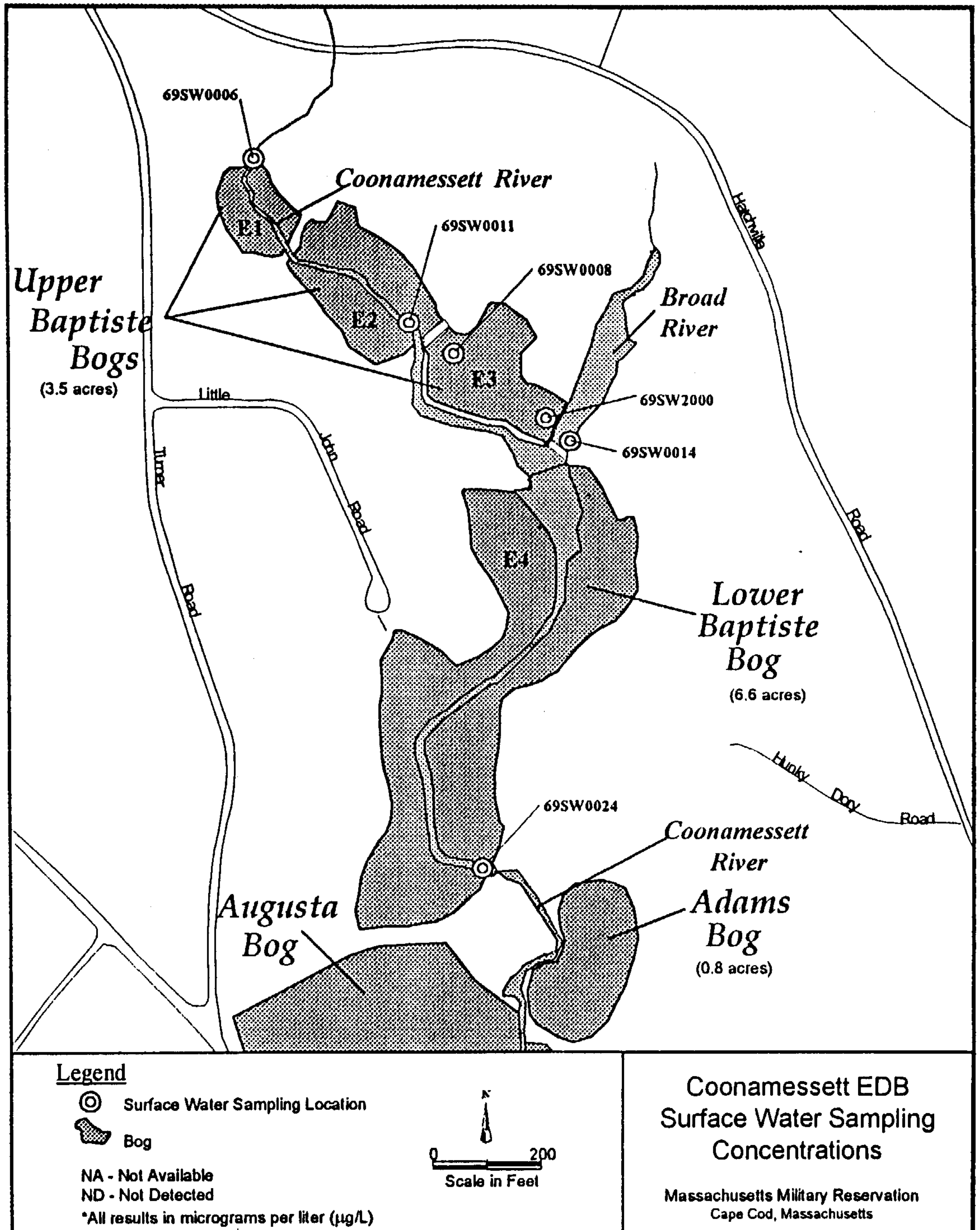




Falmouth Coonamessett
Public Supply Well
FS-28
Coonamessett Pond
Sam Turner Road
Thomas B. Landers Road
Hatchville Road
Baptiste Bogs
Augusta Bog
Adams Bog
Lasalle Bog
Thompson Bogs
Chaston Bog
Abandoned
Round Pond
Jenkins Pond
Pond 14 Reach
Pond 14
Reservoir Bog
Sandwich Road
Flax Pond
Middle Bog
Lower Bog
Route 28
Great Pond
Legend
Cranberry Bog, Surface water supply
Cranberry Bog, Groundwater water supply
Plume Contour
JE JACOBS ENGINEERING
Coonamessett River Bogs
Massachusetts Military Reservation
Cape Cod, Massachusetts
12/11/97 KK File:Edbbogcl.cdr
Figure 1-2

69SW0006	
08/97	ND
09/97	ND
10/97	ND
11/97	ND
12/97	ND
01/98	ND
02/98	ND
03/98	ND
04/98	ND
05/98	ND
06/98	ND
07/98	ND

69SW0011	
03/98	ND
04/98	ND
05/98	ND
06/98	ND
07/98	ND



69SW0008

No inlet flume available to sample

69SW0014	
07/97	0.210
08/97	0.140
09/97	0.120
10/97	0.026
11/97	0.080
12/97	0.017
01/98	0.018
02/98	0.020
03/98	0.024
04/98	0.066
05/98	0.110
06/98	0.043
07/98	0.021

69SW2000	
04/98	0.035
05/98	0.091
06/98	0.050
07/98	0.033

69SW0024	
07/97	0.068
08/97	0.120
09/97	0.077
10/97	ND
11/97	0.062
12/97	0.063
01/98	ND
02/98	ND
03/98	0.059
04/98	0.030
05/98	0.078
06/98	0.043
07/98	NA

Note: MDEP MCL for Drinking Water = 0.02 µg/L · 10-5 Risk-... surface water concentration for integrated receptor ~0.110 ug/L

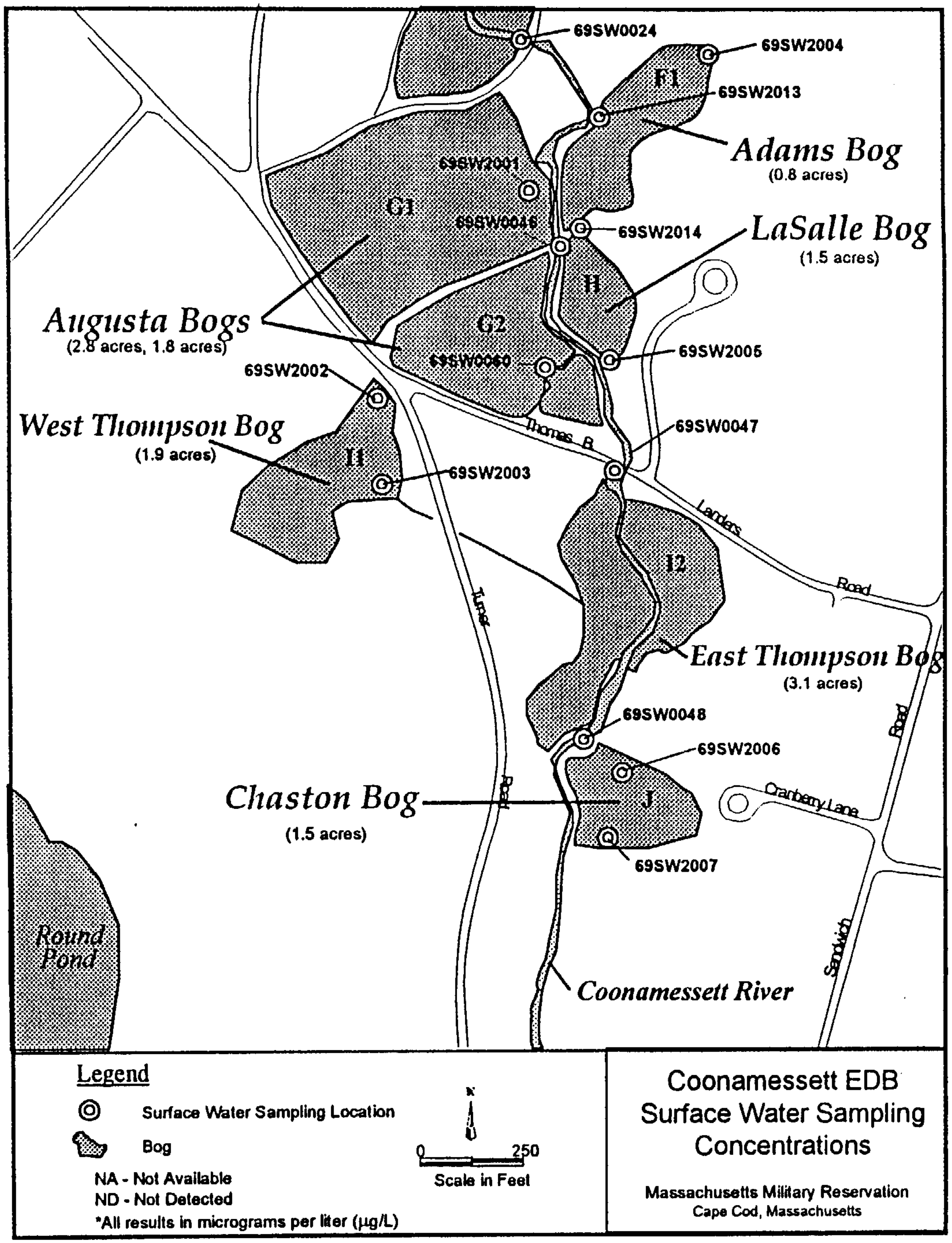
69SW0046	
07/97	0.064
08/97	0.100
09/97	0.074
10/97	ND
11/97	0.053
12/97	0.022
01/98	ND
02/98	ND
03/98	0.040
04/98	0.026
05/98	ND
06/98	0.035
07/98	0.033

69SW2003	
04/98	ND
05/98	ND
06/98	ND
07/98	ND

69SW2001	
04/98	ND
05/98	ND
06/98	ND
07/98	ND

69SW0060	
07/97	ND
08/97	ND
09/97	ND
10/97	ND
04/98	ND
05/98	ND
06/98	ND
07/98	ND

69SW2002	
04/98	NA
05/98	NA
06/98	ND
07/98	ND



69SW0024	
06/20/97	0.077
07/17/98	0.100
08/25/97	0.120
09/09/97	0.089
10/07/97	0.098
10/27/97	ND
11/13/97	0.055
12/10/97	0.063
01/29/98	ND
02/19/98	ND
03/16/98	0.045
04/14/98	0.030
05/26/98	0.078
06/08/98	0.043
07/29/98	0.043

69SW2005	
04/98	0.036
05/98	0.040
06/98	0.008
07/98	0.011

69SW0047	
07/97	0.053
08/97	0.060
09/97	0.064
10/97	ND
11/97	0.040
12/97	0.014
01/97	ND
02/97	ND
03/97	0.034
04/98	0.016
05/98	0.040
06/98	0.030
07/98	0.029

69SW2006	
07/18/97	ND
08/11/97	ND
09/09/97	ND
10/07/97	ND
11/11/97	ND
12/10/97	ND
01/29/98	ND
02/19/98	ND
03/16/98	ND
04/14/98	ND
05/26/98	ND
07/08/98	0.024
07/29/98	ND

69SW2004	
04/98	ND
05/98	ND
06/98	ND
07/98	NA

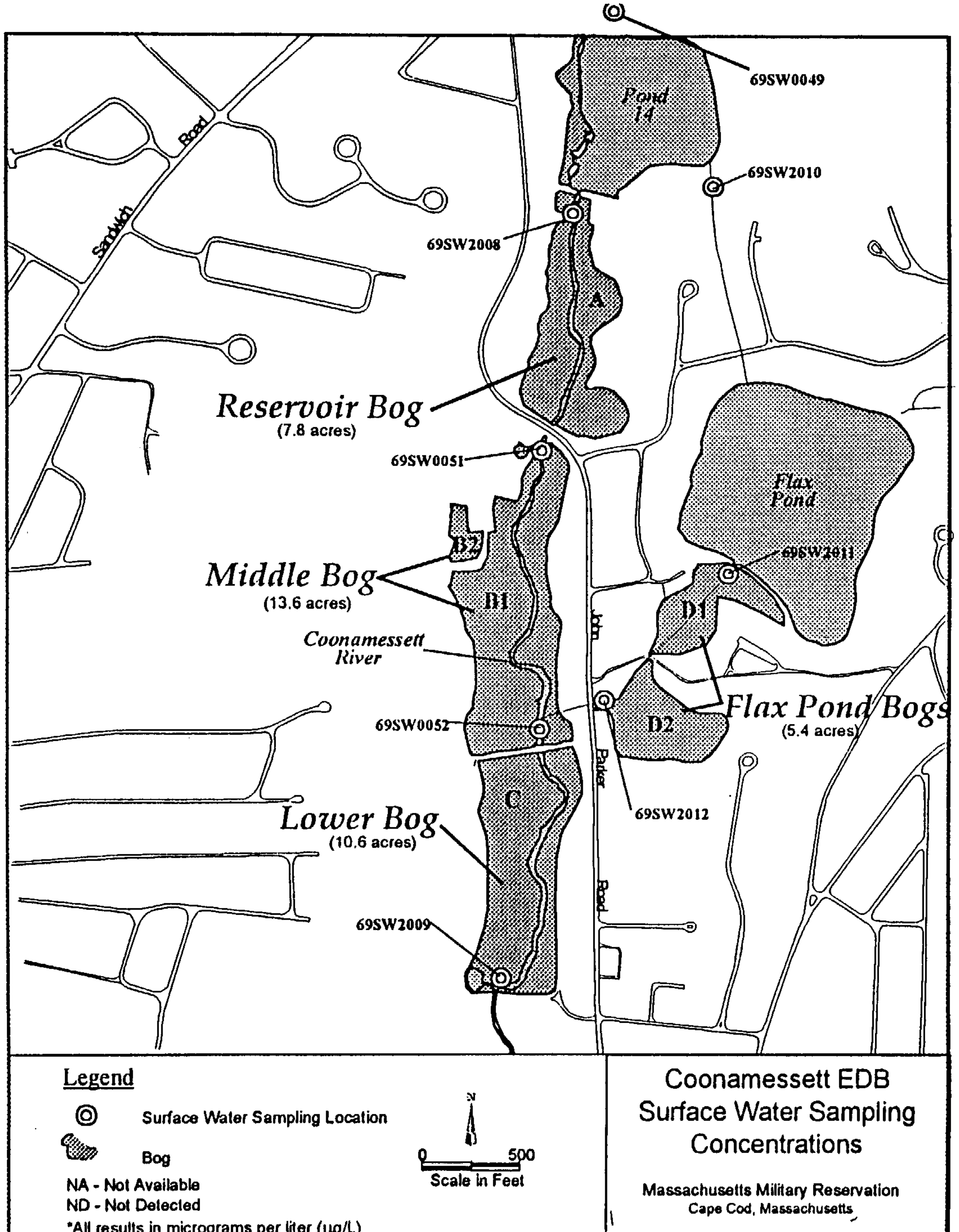
69SW2013	
04/98	0.044
05/98	0.044
06/98	0.031
07/98	0.030

69SW2014	
07/17/97	0.250
08/13/97	0.196
09/16/97	0.120
10/07/97	0.049
11/11/97	0.080
12/10/97	0.017
01/29/98	0.018
02/19/98	0.020
03/16/98	0.024
04/01/98	ND
05/26/98	0.110
07/08/98	0.010
07/29/98	0.034

69SW0048	
04/98	0.033
05/98	0.037
06/98	ND
07/98	0.028

69SW2007	
04/98	ND
05/98	ND
06/98	ND
07/98	ND

Note: MDEP MCL for Drinking Water = 0.02 µg/L; 10^{-5} Risk-based surface water concentration for integrated receptor ~0.110 µg/L



69SW2008

04/98	0.011
05/98	0.015
06/98	ND
07/98	0.007

69SW0051

04/98	ND
05/98	0.012
06/98	ND
07/98	0.006

69SW0052

11/96	ND
12/96	ND
01/97	ND
02/97	ND
03/97	0.009
04/97	ND
04/98	ND
05/98	ND
06/98	ND
07/98	ND

69SW2009

04/98	ND
05/98	ND
06/98	ND
07/98	ND

69SW0049

07/14/97	0.038
08/12/97	0.040
09/10/97	0.048
10/17/97	ND
11/13/97	0.016
12/10/97	0.026
01/29/98	ND
02/19/98	ND
03/16/98	0.019
04/14/98	0.014
05/26/98	NA
07/08/98	NA
07/29/98	0.023

69SW2010

04/98	0.0130
05/98	0.0110
06/98	ND
07/98	NA

69SW2011

04/98	ND
05/98	ND
06/98	ND
07/98	ND

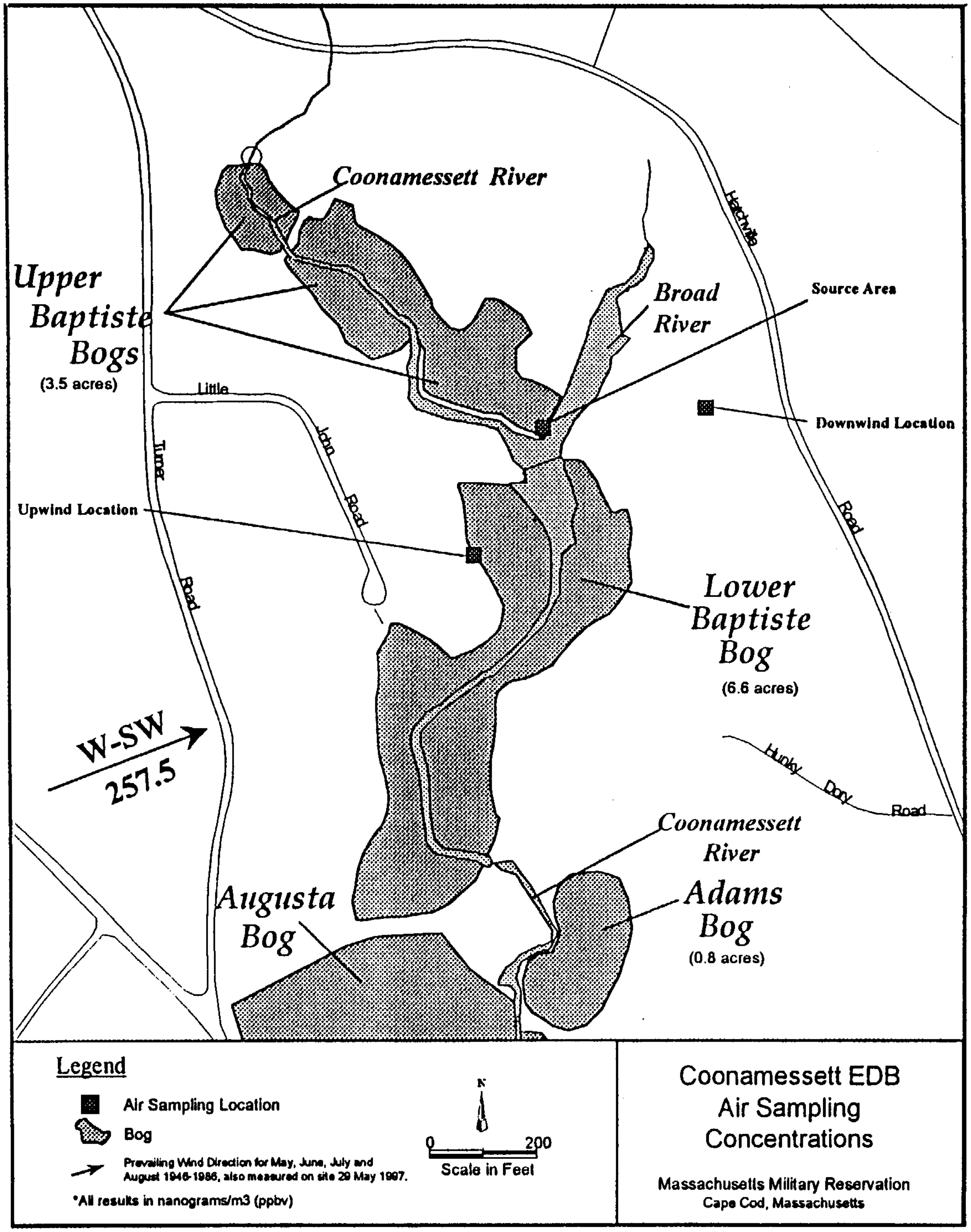
69SW2012

04/98	ND
05/98	ND
06/98	ND
07/98	ND

Note: MDEP MCL for Drinking Water = 0.02 µg/L ; 10[-5] Risk-based surface water concentration for integrated receptor ~0.1[illegible] µg/L

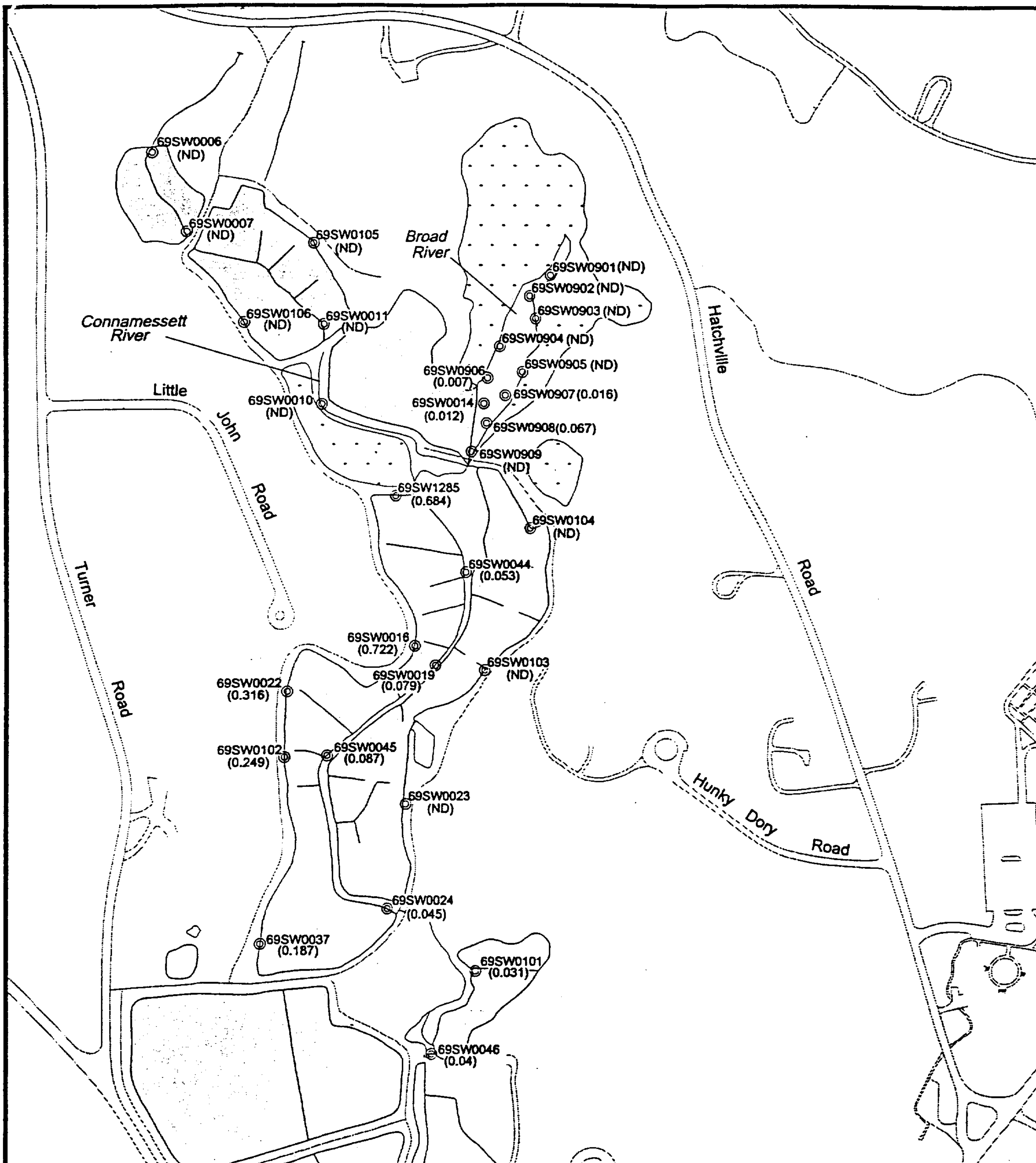
Upwind	EDB (ppbv)
7/17/97	0.005
07/24/97	0.004
07/31/97	0.001U
08/14/97	0.003
08/27/97	0.002

Crosswind	EDB (ppbv)
5/29/97	0.001U



Source	EDB (ppbv)
05/29/97	0.002U
07/17/97	0.007
07/24/97	0.01
07/31/97	0.003
08/14/97	0.007
08/27/97	0.002

Downwind	EDB (ppbv)
05/29/97	0.002U
07/17/97	0.007
07/24/97	0.001U
07/31/97	0.001U
08/14/97	0.002
08/27/97	0.001



Legend

◎	Sample Location
(0.053)	EDB Concentrations (μg/L)
(ND)	Not Detected

Wetland

Bog

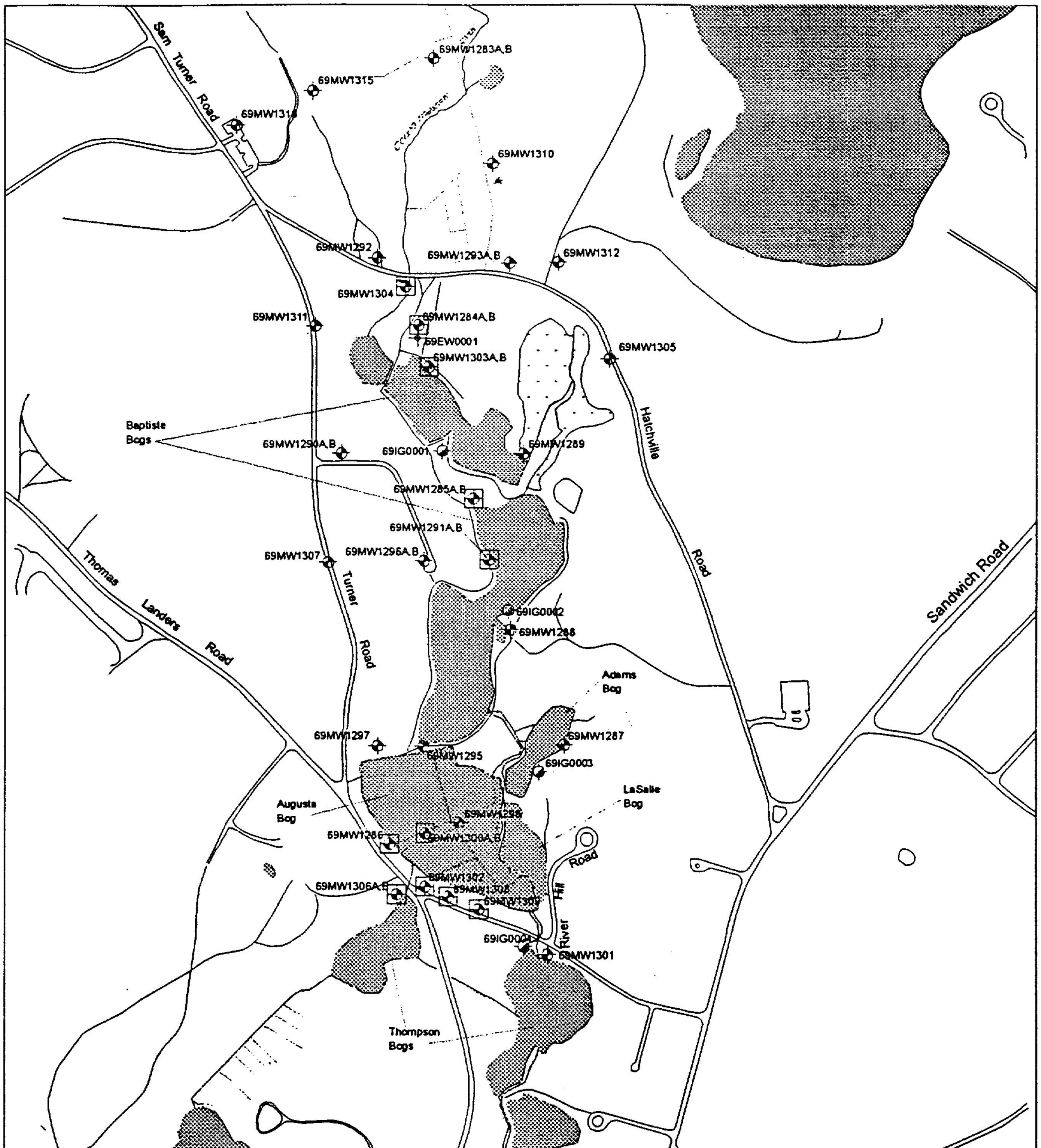
0 300
Scale in Feet

JACOBS ENGINEERING

Risk Assessment
Surface Water and Sediment
Sampling Locations
Baptiste Bog Area
Massachusetts Military Reservation
Cape Cod, Massachusetts

8/27/98 mm File...Sum-CR1.dwg C98

Figure 4



Legend

Monitoring Well

Existing Irrigation Wells

Monitoring Well Sampled Quaterly for EDB

0 250 500

Scale in Feet

JE JACOBS ENGINEERING

Quarterly Performance Monitoring Locations

Massachusetts Military Reservation
Cape Cod, Massachusetts

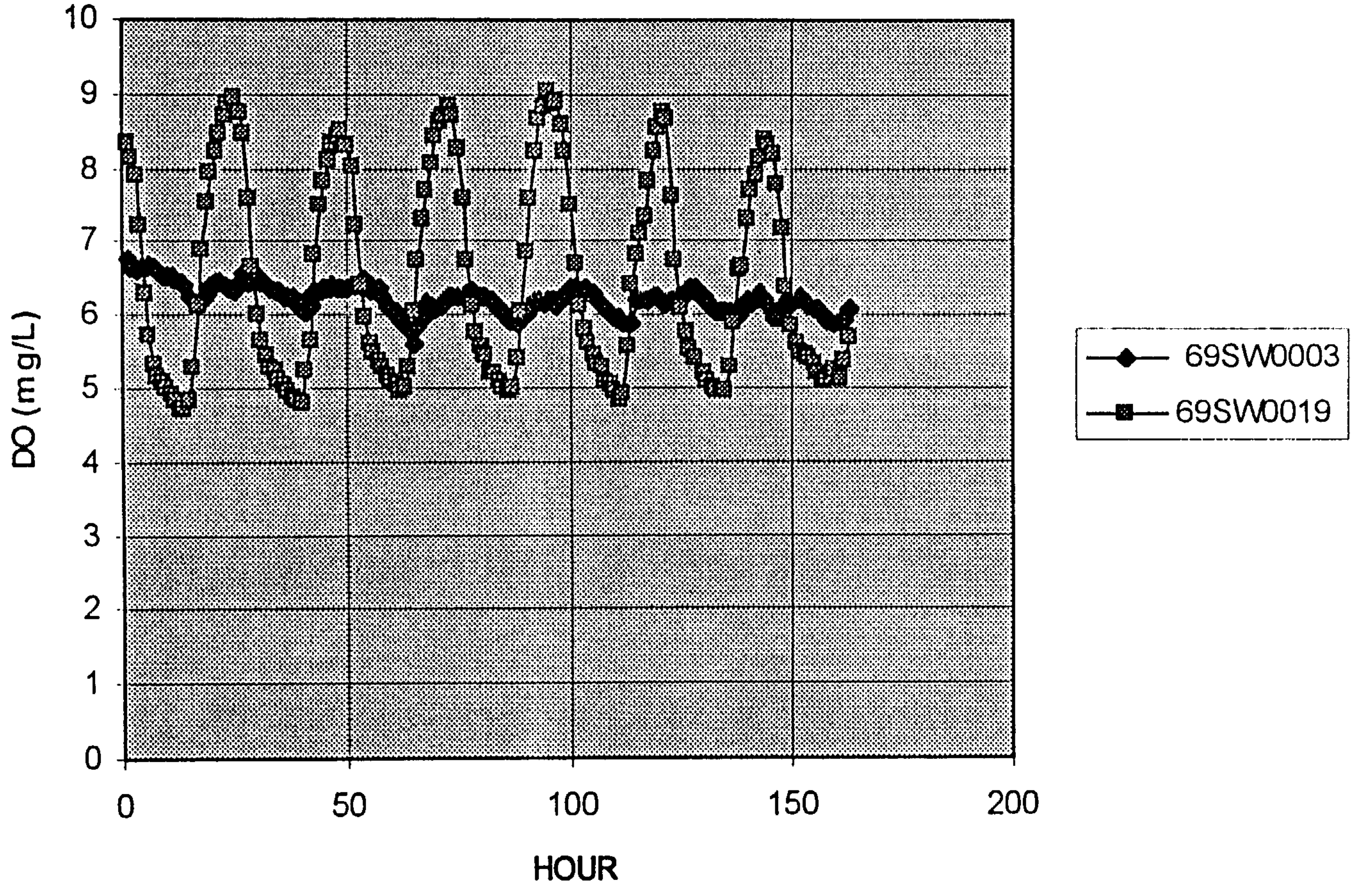
6/22/98 mm...gwmw.DWG

Figure 3-1

MASSACHUSETTS MILITARY RESERVATION

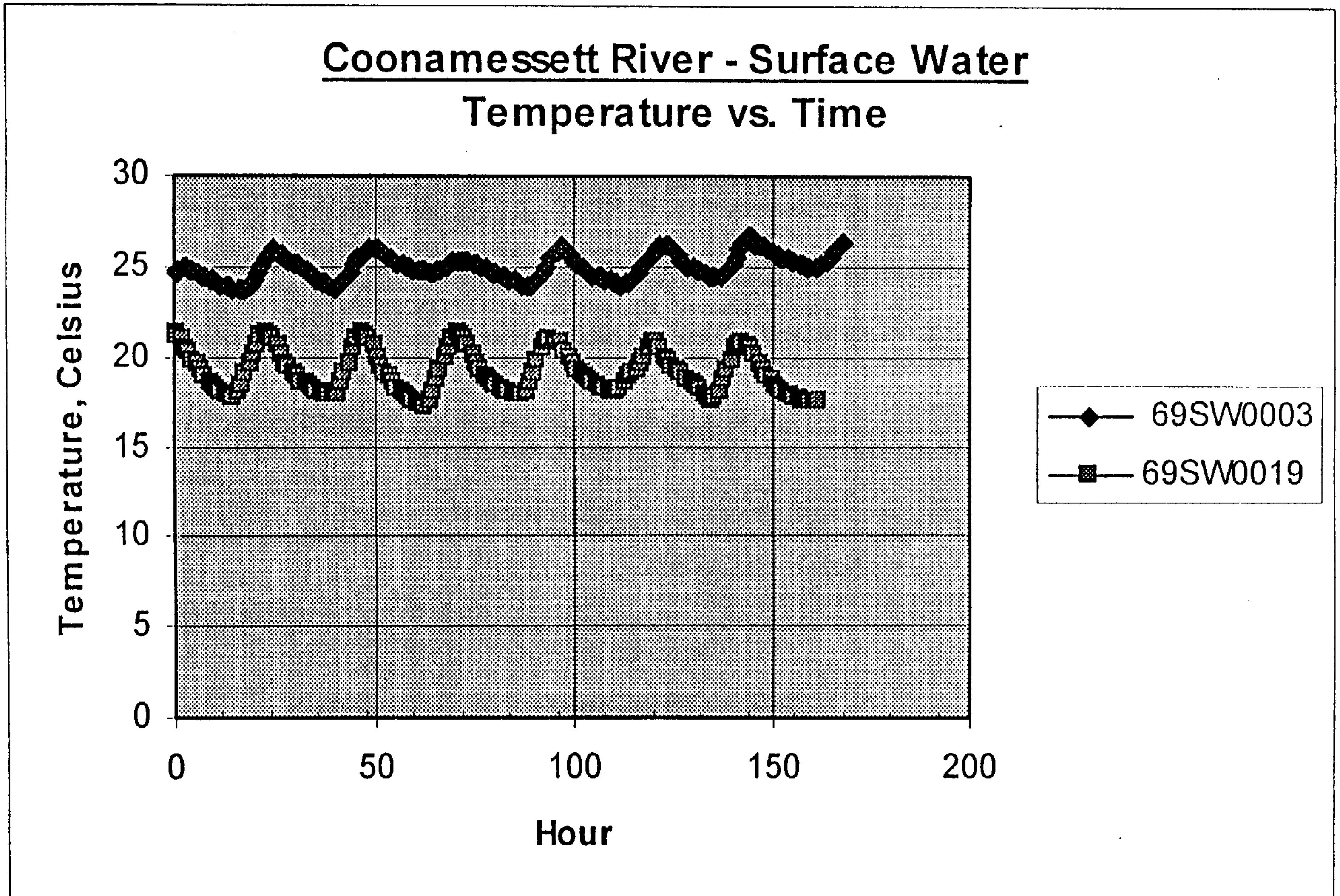
Installation Restoration Program

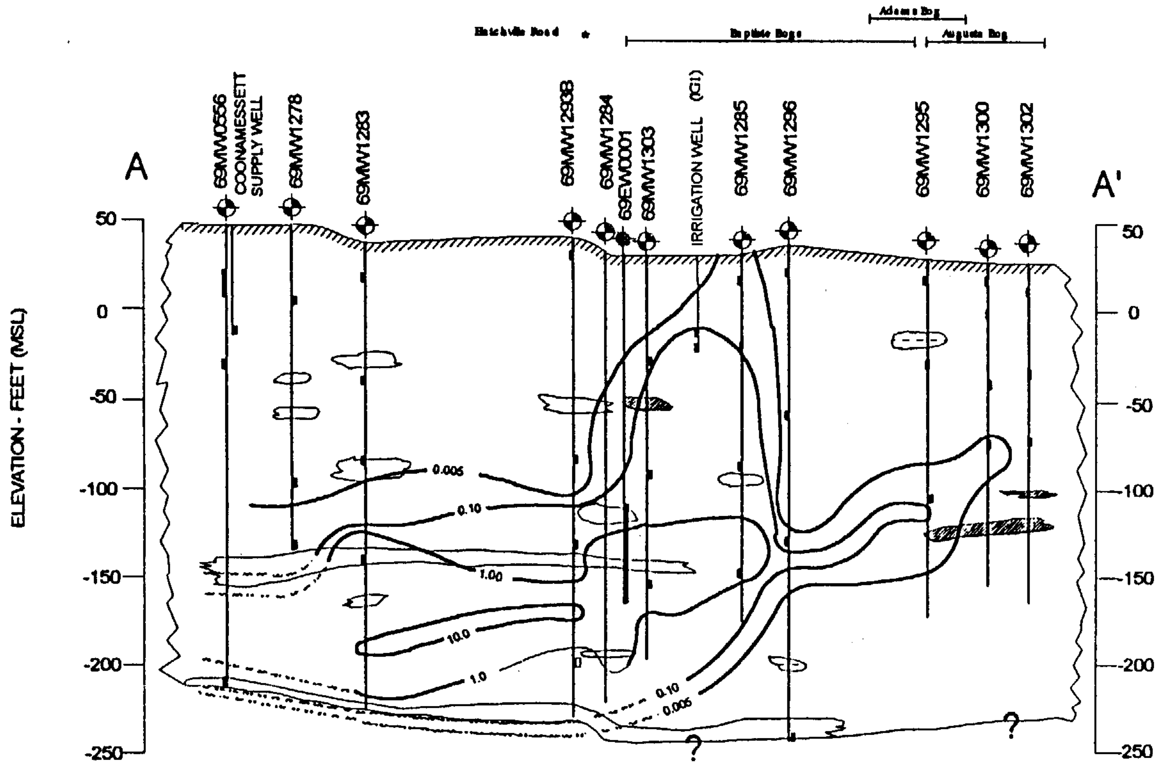
Coonamessett River - Surface Water
Dissolved Oxygen vs. Time

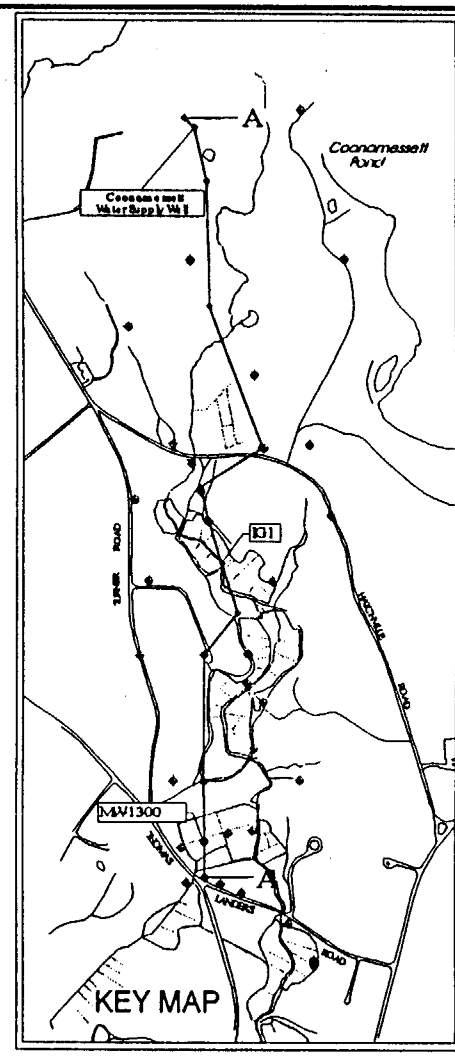


Installation Restoration Program

MASSACHUSETTS MILITARY RESERVATION







Note: EDB Concentrations based upon sampling and analysis prior to Dec. 1996

Legend

(well symbol)	Monitoring Well
0.02	Monitoring Well Sample
0.02	EDB Concentration Isopleth
ND	Not Detected
ND	Screened
ND	Auger Samples
	Well Screen

Note: Concentrations in µg/L

0 125 250
Scale in Feet
100H:5V

JACOBS ENGINEERING

EDB Isoconcentration Along Cross Section A-A' of FS-28

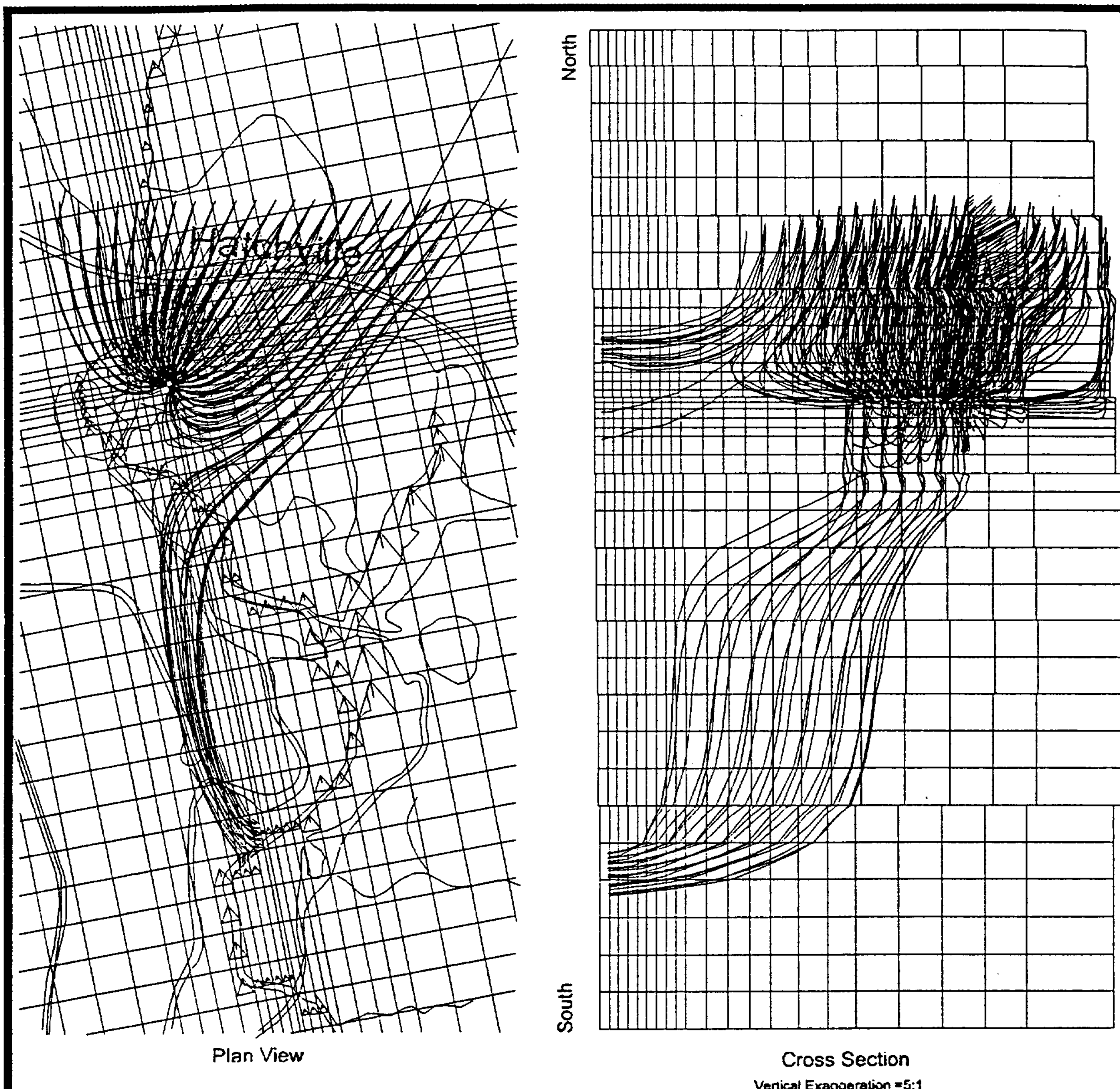
Massachusetts Military Reservation
Cape Cod, Massachusetts

5/18/98 mm File...Xsect1.cdr

Figure 2-2

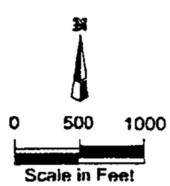
EW-1 Interim Action

- 8” diameter extraction well
- Two 20,000 lb Granular Activated Carbon vessels
- Average Influent range ~ 0.5 to 1.3 μg/L
- Effluent = Non-Detect



Legend

Drain in EW-1 Zoom Model



JACOBS ENGINEERING

Forward Tracking of Particles from Hatchville Road, EW0001 Pumping at 600 gpm

Massachusetts Military Reservation

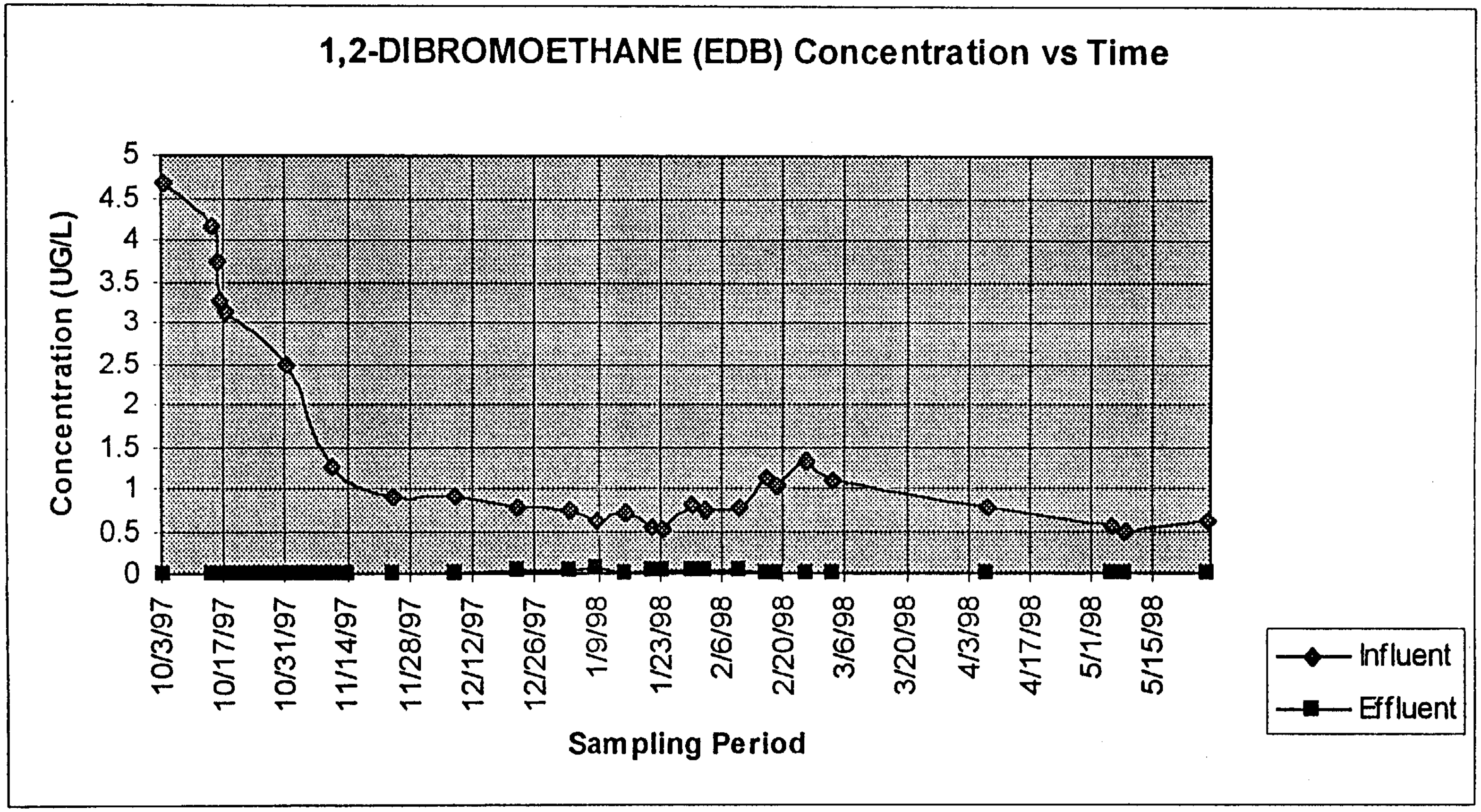
Cape Cod, Massachusetts

3/7/98 la File: htch600.dwg

Figure 3-9

Installation Restoration Program

EW-1 Influent/Effluent



MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

EW-1 Mass Removal/Modeling

	December 1996 (Initial Conditions)	10 Month (Reference Conditions)	Scenario A @ 1 yr	Scenario A @ 2 yr	Scenario A @ 5 yr	Scenario A @ 10 yr	Scenario A @ 15 yr
EDB in Model (kg)							
Total EDB at End of Interval	7.0	6.2	4.7	3.5	1.6	0.5	0.2
Loss Relative to 10 months	-0.7	0.0	1.5	2.7	4.6	5.7	6.0
% Loss	-12 %	0 %	24 %	43 %	74 %	91 %	96 %
Cumulative EDB Losses (%)							
Other Wells	n/a	0 %	1 %	1 %	3 %	3 %	3 %
EW Well(s)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Well Points	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Coonamessett R. (Baptiste Bogs)	n/a	10 %	23 %	41 %	71 %	88 %	93 %
Total Loss	n/a	10 %	24 %	43 %	74 %	91 %	96 %
Flux of EDB to Discharge Points (g/day)*							
Other Wells	n/a	0.09	0.13	0.10	0.04	0.01	0.01
EW Well(s)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Well Points	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total Wells	n/a	0.09	0.13	0.10	0.04	0.01	0.01
Coonamessett R. (Baptiste Bogs)	n/a	3.56	3.98	2.51	1.12	0.24	0.10
Total Loss	n/a	3.65	4.12	2.61	1.15	0.25	0.11
EDB Concentration in Pumped Water (μg/L)*							
Other Wells	n/a	n/a	0.060	0.045	0.017	0.006	0.003
EW Well(s)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Well Points	n/a	n/a	n/a	n/a	n/a	n/a	n/a
EDB Concentration in the Coonamessett R.							
Model-predicted flow exiting Baptiste bogs (cfs)*	7.2	7.2	7.2	7.2	7.2	7.2	7.2
Flow including return flow (cfs)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
EDB Due to Combined Discharge Zones (μg/L)*	n/a	0.20	0.23	0.14	0.06	0.014	0.006
EDB with return flow (μg/L)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
EDB Due to Southern Discharge Zone (μg/L)*	n/c	n/c	n/c	n/c	n/c	n/c	n/c

	Scenario B1 @ 1 yr	Scenario B1 @ 2 yr	Scenario B1 @ 5 yr	Scenario B1 @ 10 yr	Scenario B1 @ 15 yr	Scenario B2 @ 2 yr	Scenario B2 @ 5 yr	Scenario C @ 2 yr	Scenario C @ 5 yr
EDB in Model (kg)									
Total EDB at End of Interval	4.2	2.9	1.3	0.5	0.2	3.1	1.4	3.0	1.4
Loss Relative to 10 months	2.0	3.3	4.9	5.8	6.0	3.2	4.8	3.2	4.9
% Loss	33 %	53 %	79 %	93 %	97 %	51 %	78 %	52 %	78 %
Cumulative EDB Losses (%)									
Other Wells	1 %	1 %	3 %	3 %	3 %	1 %	3 %	1 %	3 %
EW Well(s)	21 %	33 %	54 %	63 %	66 %	28 %	44 %	35 %	52 %
Well Points	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Coonamessett R. (Baptiste Bogs)	11 %	18 %	22 %	26 %	28 %	22 %	31 %	16 %	23 %
Total Loss	33 %	53 %	79 %	93 %	97 %	51 %	78 %	51 %	78 %
Flux of EDB to Discharge Points (g/day)*									
Other Wells	0.13	0.10	0.04	0.01	0.01	0.13	0.04	0.13	0.04
EW Well(s)	2.45	1.86	0.67	0.12	0.04	1.55	0.49	1.64	0.55
Well Points	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total Wells	2.58	1.96	0.71	0.14	0.05	1.69	0.52	1.77	0.59
Coonamessett R. (Baptiste Bogs)	1.83	0.58	0.20	0.07	0.03	0.85	0.42	0.60	0.35
Total Loss	4.41	2.54	0.91	0.21	0.08	2.53	0.95	2.37	0.94
EDB Concentration in Pumped Water (μg/L)*									
Other Wells	0.060	0.045	0.017	0.006	0.003	0.060	0.017	0.060	0.017
EW Well(s)	0.750	0.568	0.205	0.038	0.013	0.712	0.223	0.430	0.145
Well Points	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
EDB Concentration in the Coonamessett R.									
Model-predicted flow exiting Baptiste bogs (cfs)*	6.3	6.3	6.3	6.3	6.3	6.6	6.6	6.1	6.1
Flow including return flow (cfs)	7.6	7.6	7.6	7.6	7.6	7.5	7.5	7.7	7.7
EDB Due to Combined Discharge Zones (μg/L)*	0.12	0.04	0.013	0.005	0.002	0.053	0.026	0.040	0.024
EDB with return flow (μg/L)	0.10	0.03	0.011	0.004	0.002	0.046	0.023	0.032	0.019
EDB Due to Southern Discharge Zone (μg/L)*	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c

	Scenario D @ 2 yr	Scenario D @ 5 yr	Scenario E @ 1 yr	Scenario E @ 2 yr	Scenario E @ 5 yr	Scenario E @ 10 yr	Scenario E @ 15 yr	Scenario E2 @ 1 yr	Scenario E2 @ 2 yr
EDB in Model (kg)									
Total EDB at End of Interval	2.9	1.2	4.2	2.9	1.3	0.5	0.2	4.2	2.9
Loss Relative to 10 months	3.3	5.0	2.0	3.3	4.9	5.8	6.0	2.0	3.3
% Loss	54 %	80 %	33 %	53 %	79 %	93 %	97 %	33 %	53 %
Cumulative EDB Losses (%)									
Other Wells	1 %	3 %	1 %	1 %	3 %	3 %	3 %	1 %	1 %
EW Well(s)	44 %	65 %	21 %	33 %	54 %	63 %	66 %	21 %	33 %
Well Points	n/a	n/a	n/a	6 %	9 %	11 %	12 %	0 %	5 %
Coonamessett R. (Baptiste Bogs)	9 %	12 %	11 %	12 %	14 %	15 %	16 %	11 %	13 %
Total Loss	54 %	80 %	33 %	53 %	79 %	93 %	97 %	33 %	53 %
Flux of EDB to Discharge Points (g/day)*									
Other Wells	0.13	0.04	0.13	0.10	0.04	0.01	0.01	0.13	0.10
EW Well(s)	1.91	0.73	2.45	1.86	0.67	0.12	0.04	2.45	1.86
Well Points	n/a	n/a	n/a	0.48	0.10	0.04	0.02	0.05	0.39
Total Wells	2.04	0.77	2.60	2.33	0.81	0.19	0.07	2.60	2.28
Coonamessett R. (Baptiste Bogs)	0.34	0.12	1.78	0.10	0.10	0.03	0.01	1.78	0.19
Total Loss	2.39	0.89	4.37	2.43	0.91	0.22	0.08	4.37	2.47
EDB Concentration in Pumped Water (μg/L)*									
Other Wells	0.060	0.017	0.060	0.045	0.017	0.006	0.003	0.060	0.045
EW Well(s)	0.270	0.103	0.750	0.568	0.205	0.038	0.013	0.750	0.568
Well Points	n/a	n/a	n/a	0.042	0.009	0.004	0.002	n/a	0.047
EDB Concentration in the Coonamessett R.									
Model-predicted flow exiting Baptiste bogs (cfs)*	5.1	5.1	2.6	2.6	2.6	2.6	2.6	3.3	3.3
Flow including return flow (cfs)	8.0	8.0	8.6	8.6	8.6	8.6	8.6	8.0	8.0
EDB Due to Combined Discharge Zones (μg/L)*	0.027	0.010	0.28†	0.015†	0.016†	0.004†	0.002†	0.22	0.02
EDB with return flow (μg/L)	0.018	0.006	0.08†	0.005†	0.005†	0.001†	0.000†	0.09	0.01
EDB Due to Southern Discharge Zone (μg/L)*	n/c	n/c	n/c	0.000	0.000	0.000	0.000	n/c	n/c

Notes:

n/a = not applicable

n/c = not calculated

* Rates and concentrations at the end of each time interval. Flow rates in the river do not include return flow from the EW well(s) treatment plant(s).

† Conce[illegible]s tabulated for the northern discharge zone only (no EDB is discharged from the southern zone in Scenario E

MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

FS-28 Time Critical Removal Action

- Extraction Well 1 (EW-1) continues to pump 600 gpm
- Capturing majority of plume
- Groundwater Model shows 5-7 years to complete contaminant upwelling
- Model estimates marginal risk for next 5-7 years
- EW-1 estimated to remain in operation for 10 years
- Some uncertainty associated with uncaptured portion of plume, no need for additional interim action.

Installation Restoration Program

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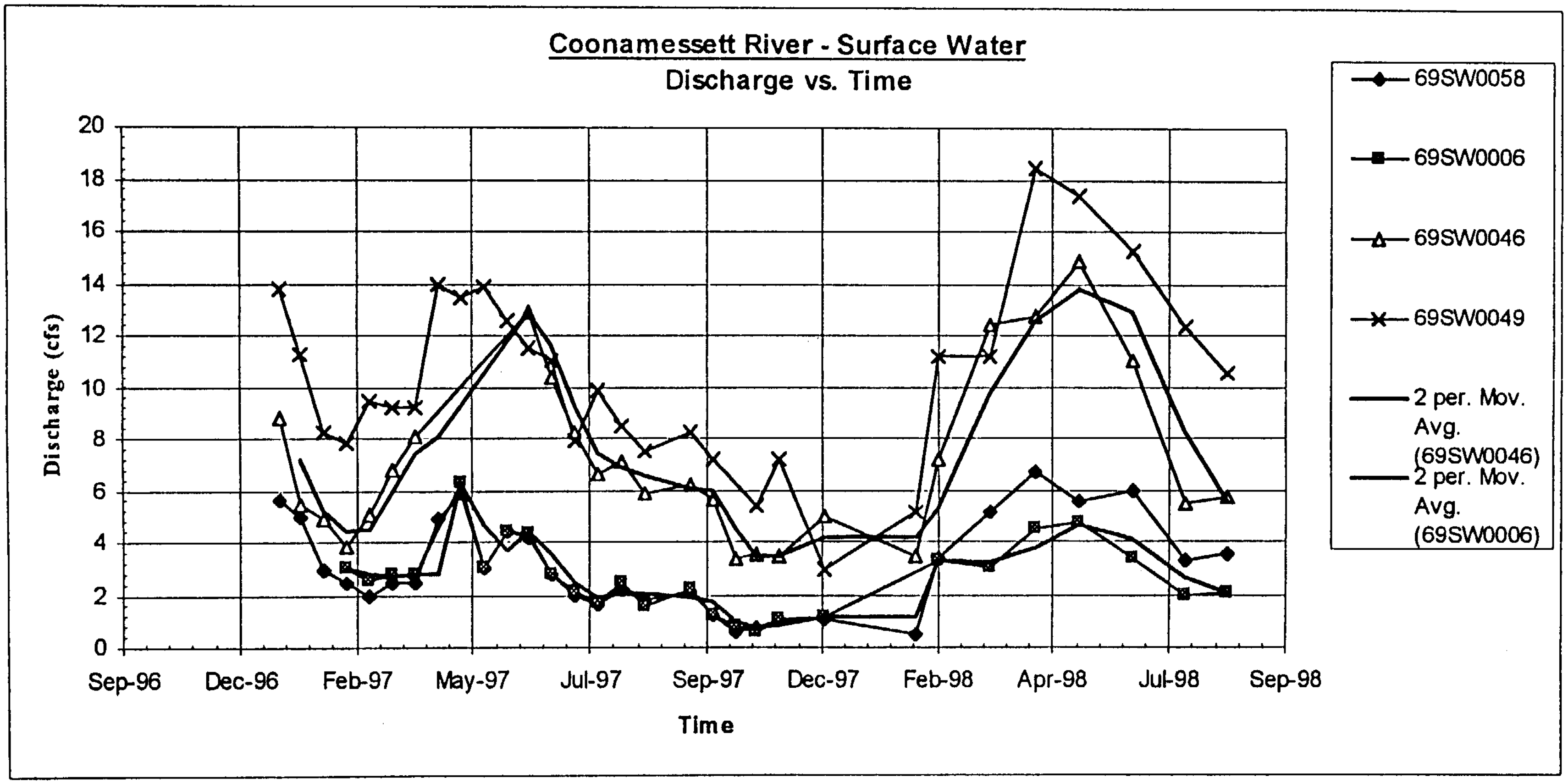
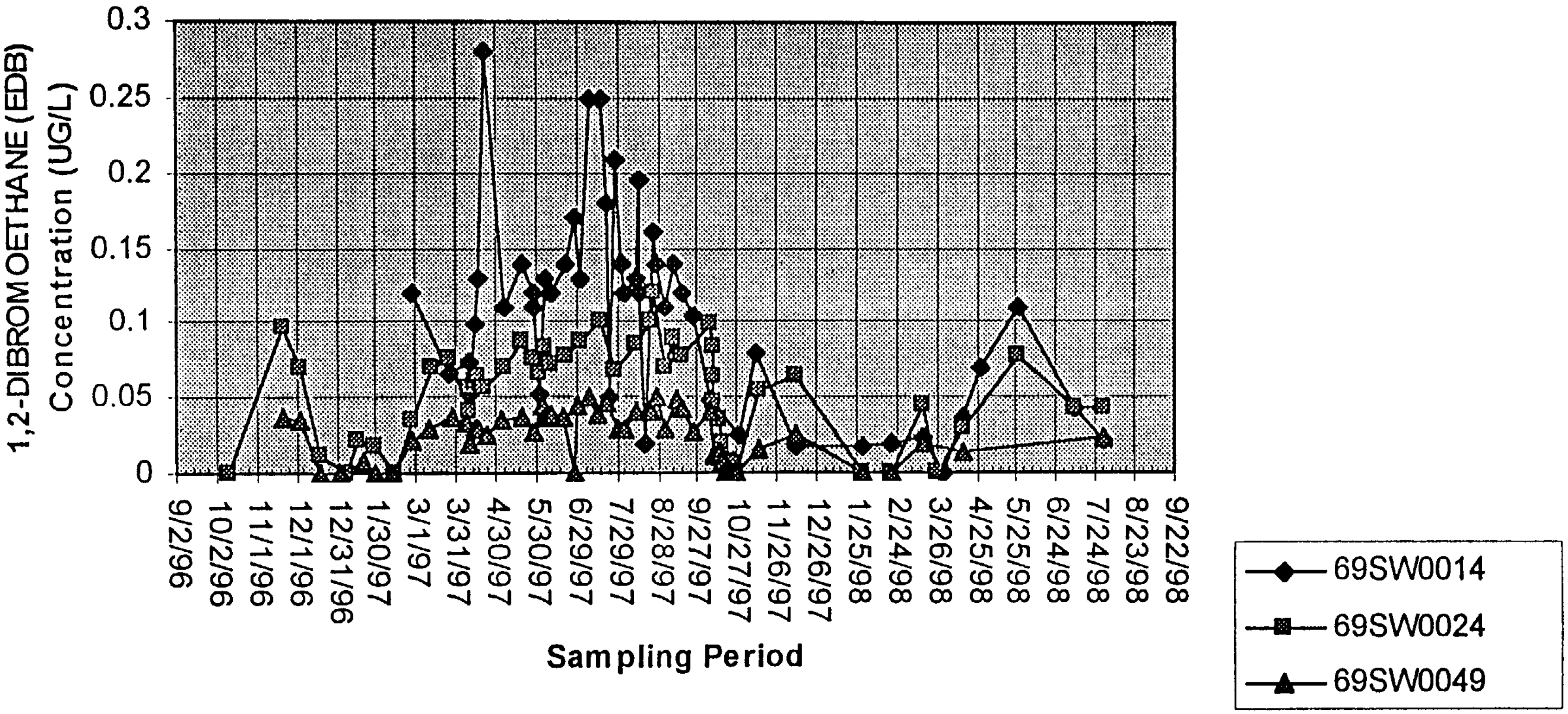


MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

Coonamessett River - Surface Water
EDB Concentration vs. Time



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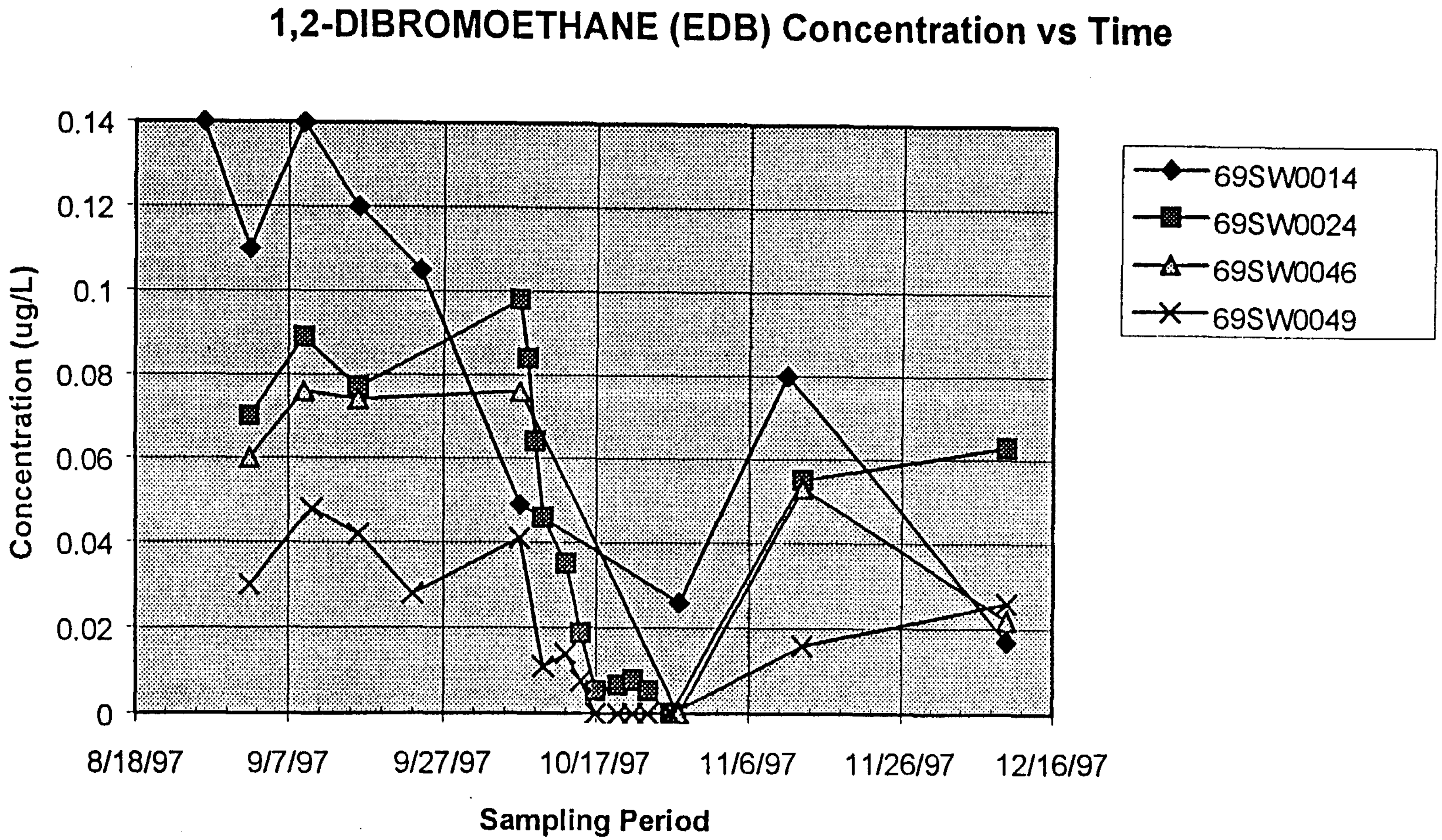
Installation Restoration Program

Influence of Flooding on the EDB Concentrations



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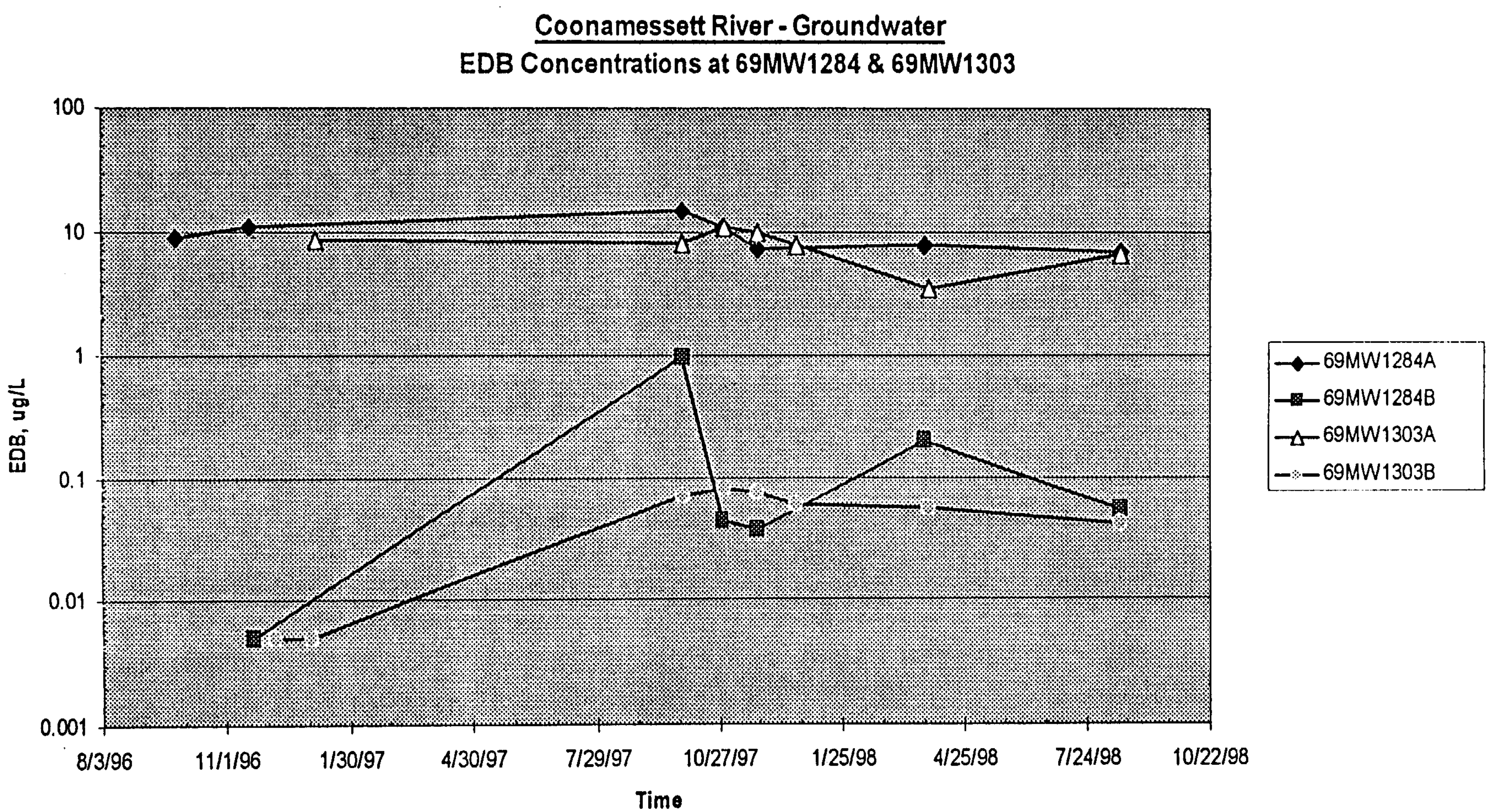
Installation Restoration Program



Installation Restoration Program

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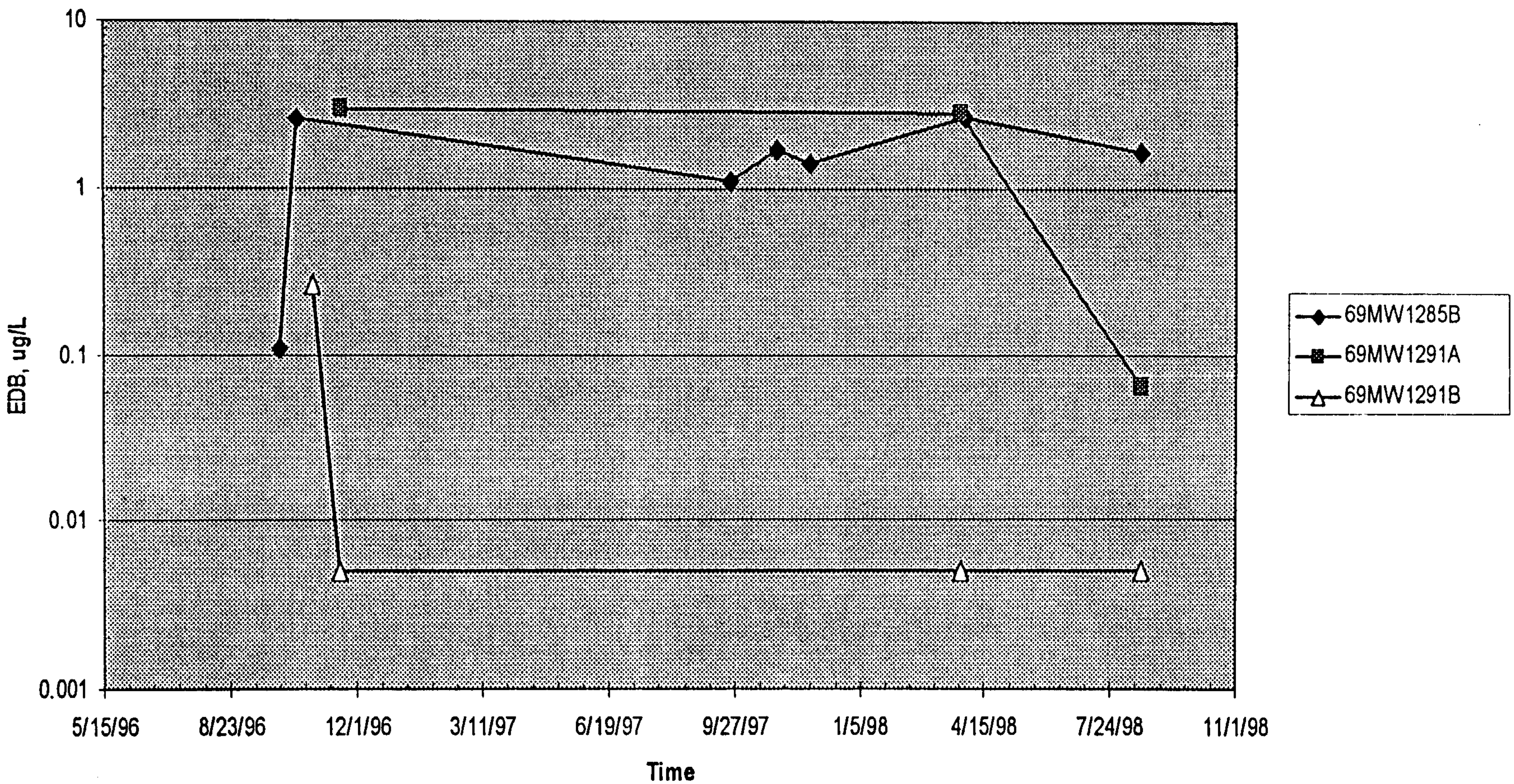
Coonamessett River - Groundwater
EDB Concentrations at 69MW1285 & 69MW1291



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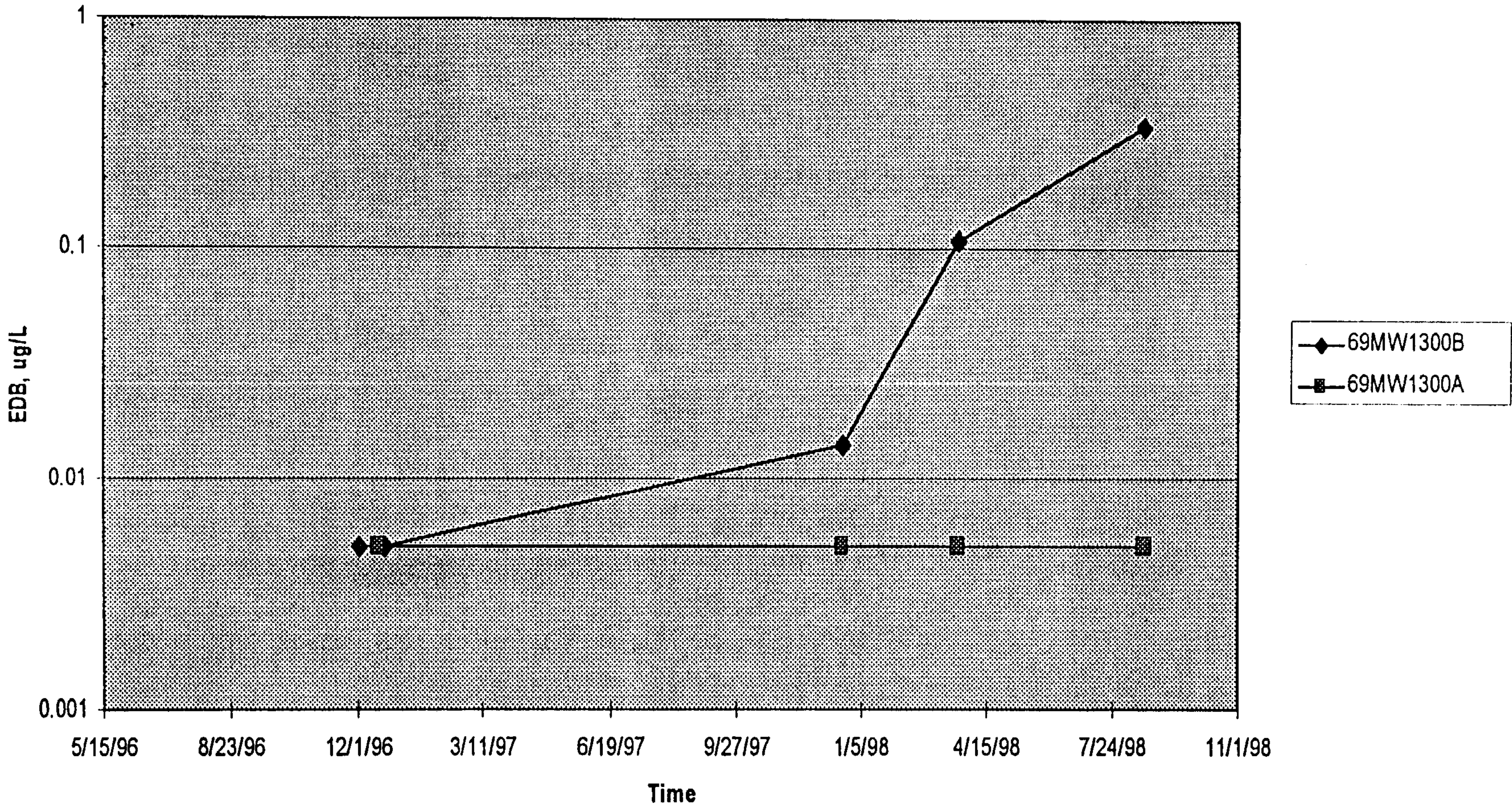
Installation Restoration Program

Coonamessett River - Groundwater

EDB Concentrations at 69MW1300



Bog Alternatives - Coonamessett River

- No Action
- Alternative A - EW-1 + Buy Out
  - acquire land, crop or long term lease
    - NOTE: Currently no legislative authority beyond CY99
- Alternative B - EW-1 + Channel Realignment
  - isolate upwelling and improve fish pathway
- Alternative C - EW-1 + Channel Realignment w/ Treatment
  - active treatment using shallow well points
- Alternative D - EW-1 + Separate All Bogs
  - separate entire river system
- Alternative E - Phased Approach
  - return small sections of bogs at a time via berms, alternate water source

MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

Coonamessett

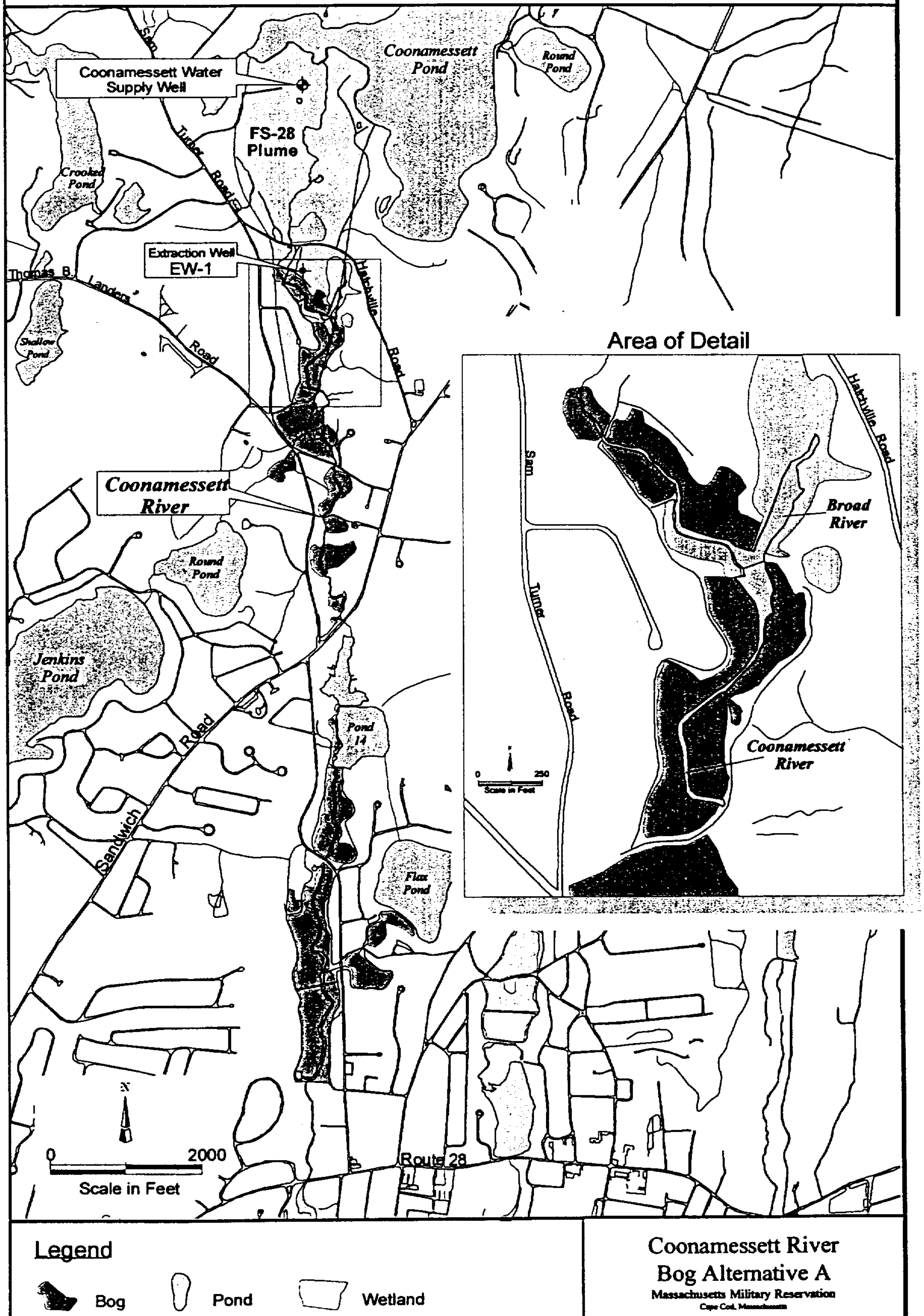
Alternative A - EW-1 + Buy Out

(Note: Currently No legislative authority beyond CY99)

- **Acquire land, crop, or long term lease**
- **Continue to operate EW-1**
- **Maintain bogs in useable condition**
- **Install controls to limit access if necessary**
- **Continue sampling and monitoring**

- Advantages
  - no disruption to current use
  - maintains bogs and channel
  - limits food chain exposure
- Disadvantages
  - several years until bogs brought back to production
  - no improvement to bogs
  - must seek additional legislative authority for compensation

Alternative A Buy Out



Coonamessett River
Bog Alternative A
Massachusetts Military Reservation
Cape Cod, Massachusetts

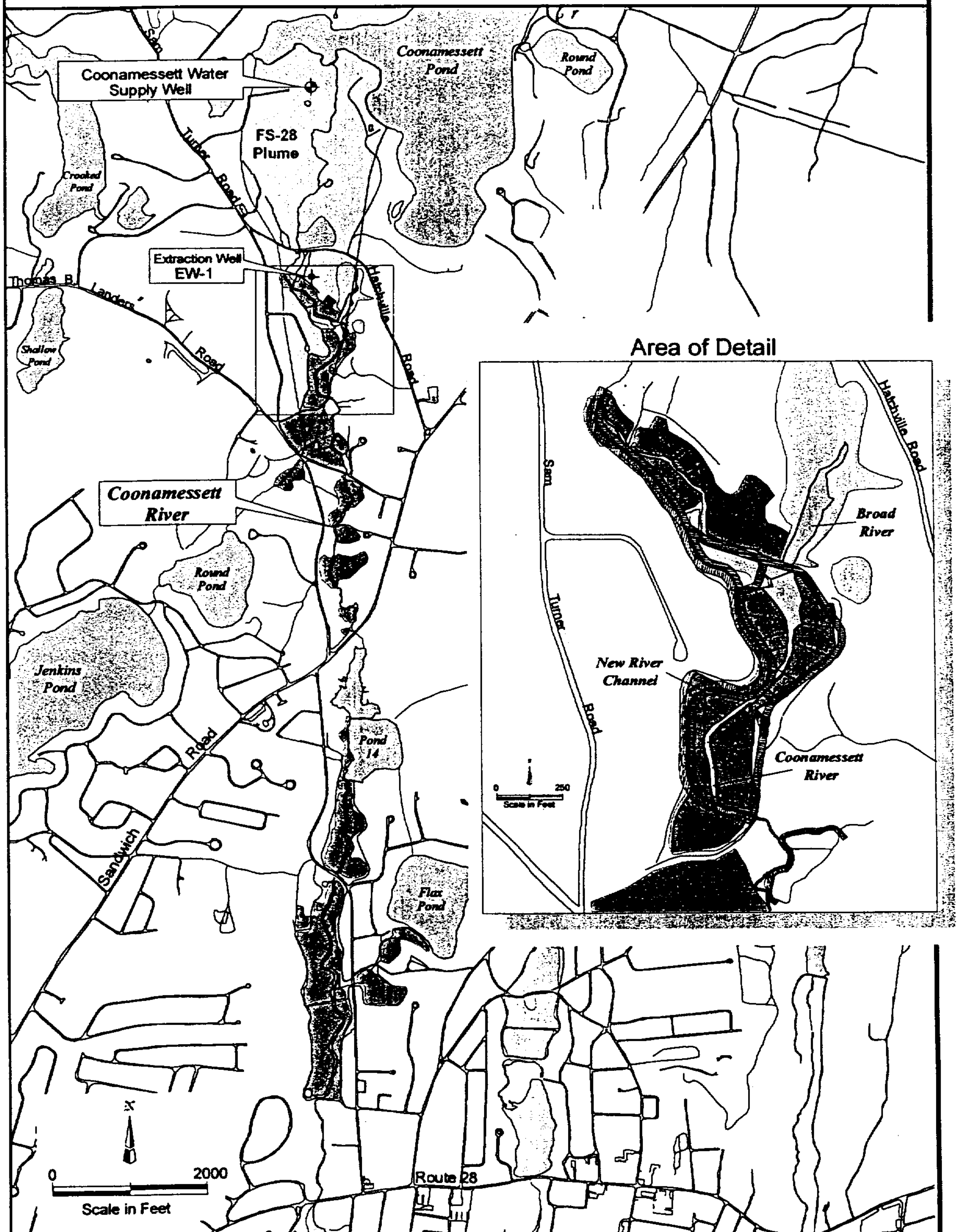
Alternative B - EW-1 + Channel Realignment

- **Continue to operate EW-1**
- **Realign channel in upper bogs (Baptiste)**
- **Line section in upwelling area**
- **Separate surface waters**
- **Create basins**
- **Mitigate wetland losses**
- **First phase of any alternative**
- **Monitor performance**

- Advantages
  - separates flows to control upwelling
  - improves fish pathway
  - creates riparian zone
- Disadvantages
  - disrupts current channel
  - EDB in upper river system
  - relies on understanding of water movement

Alternative B

Channel Realignment
Berm Upper Bogs



Legend

Bog · Pond · Wetland · Berm

Coonamessett River Bog Alternative B

Massachusetts Military Reservation

Cape Cod, Massachusetts

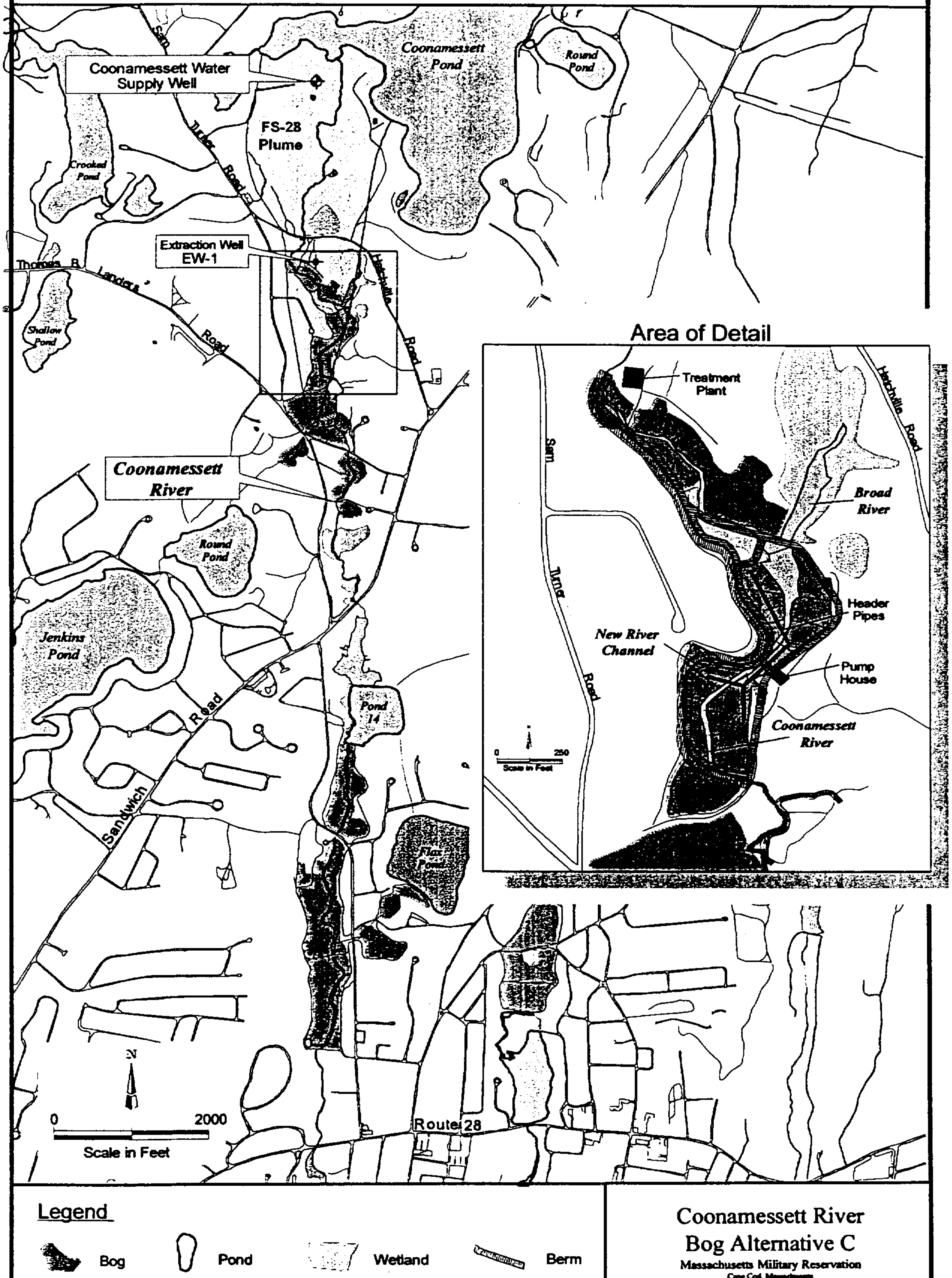
Alternative C_1 - EW-1 + Realign w/Treatment
C_2 - EW-1 + Treatment

- **Continue to operate EW-1**
- **Use shallow well points and sumps**
- **Well point spacing 6 -10' at a depth of 15'**
- **GAC treatment only**
- **Expand current plant location**
- **Second phase of alternatives**
- **Discharge in river at four locations**

- Advantages
  - gets entire river to non-detect
  - flexible
  - protects public
- Disadvantages
  - large treatment volume
  - iron bacteria and fouling
  - operation and maintenance
- Pilot Dewatering Test Needed
  - identify volume

Alternative C

Berm Upper Bogs, Shallow Well Point Treatment



Coonamessett River
Bog Alternative C
Massachusetts Military Reservation
Cape Cod, Massachusetts

Alternative D - EW-1 + Separate All Bogs

- **Continue to operate EW-1**
- **Realign upper bogs**
- **Construct berms on either side of river**
- **Provide alternative flood waters or management water**

- Advantages
  - separates river from active bogs
  - improves the fish pathway
  - in line with Town strategy
- Disadvantages
  - no buffer for floods
  - need alternative water sources for flooding

Alternative E - Phased Approach
Upper Baptiste Bogs

Upper Baptiste Bogs - E1 and E2

- One year of non-detect data available for inlet at 69SW0006 and outlet at 69SW0011
- Continue surface water sampling

Upper Baptiste Bog - E3

- Berm east end of bog to isolate from Broad River, add 2 flumes
- Continue surface water sampling

- Advantages
  - E1 and E2 Cranberries are marketable for Fall 99
  - E3 Cranberries are marketable for Fall 00
  - Isolate E3 from river
  - Can be grower implemented
- Disadvantages
  - EDB may upwell into E3 bog
  - May lose some bog area

Alternative E - Phased Approach
Lower Baptiste Bog

Option E1

- Develop the entire bog into a holding pond, dig out upper half of bog to depth ~5ft, continue sw sampling
- If no decrease, dig out lower half ~5ft
- Install a fish ladder at 69SW0024
- Goal to decrease EDB concentrations 10-fold by Fall 99

- Advantages
  - Allows degradation of EDB due to detention time in basin
  - Phased approach to reduce unnecessary impacts
- Disadvantages
  - Lose 6 acres of cranberry bog
  - Intrusive actions during excavation may cause siltation
  - Disposal of excavated material
  - May require temporary channel by-pass during construction
  - Must reconstruct bog to use again

Alternative E - Phased Approach
Lower Baptiste Bog

Option E2

- Goal to decrease EDB concentrations 10-fold by Fall 99
- Berm laterally across bog, develop upper half into a holding pond, dig out to depth ~5 ft
- Install a fish ladder at berm-river interface
- Lower half remains a cranberry bog

- Advantages
  - Allows degradation of EDB due to detention time in basin
  - Phased approach to reduce unnecessary impacts
- Disadvantages
  - Lose 3 acres of cranberry bog
  - Intrusive actions during excavation may cause siltation
  - Disposal of excavated material
  - May require temporary channel by-pass during construction
  - Must reconstruct bog to use again

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Installation Restoration Program

Coonamessett

Alternative E - Phased Approach
Lower Baptiste Bog

Option E3

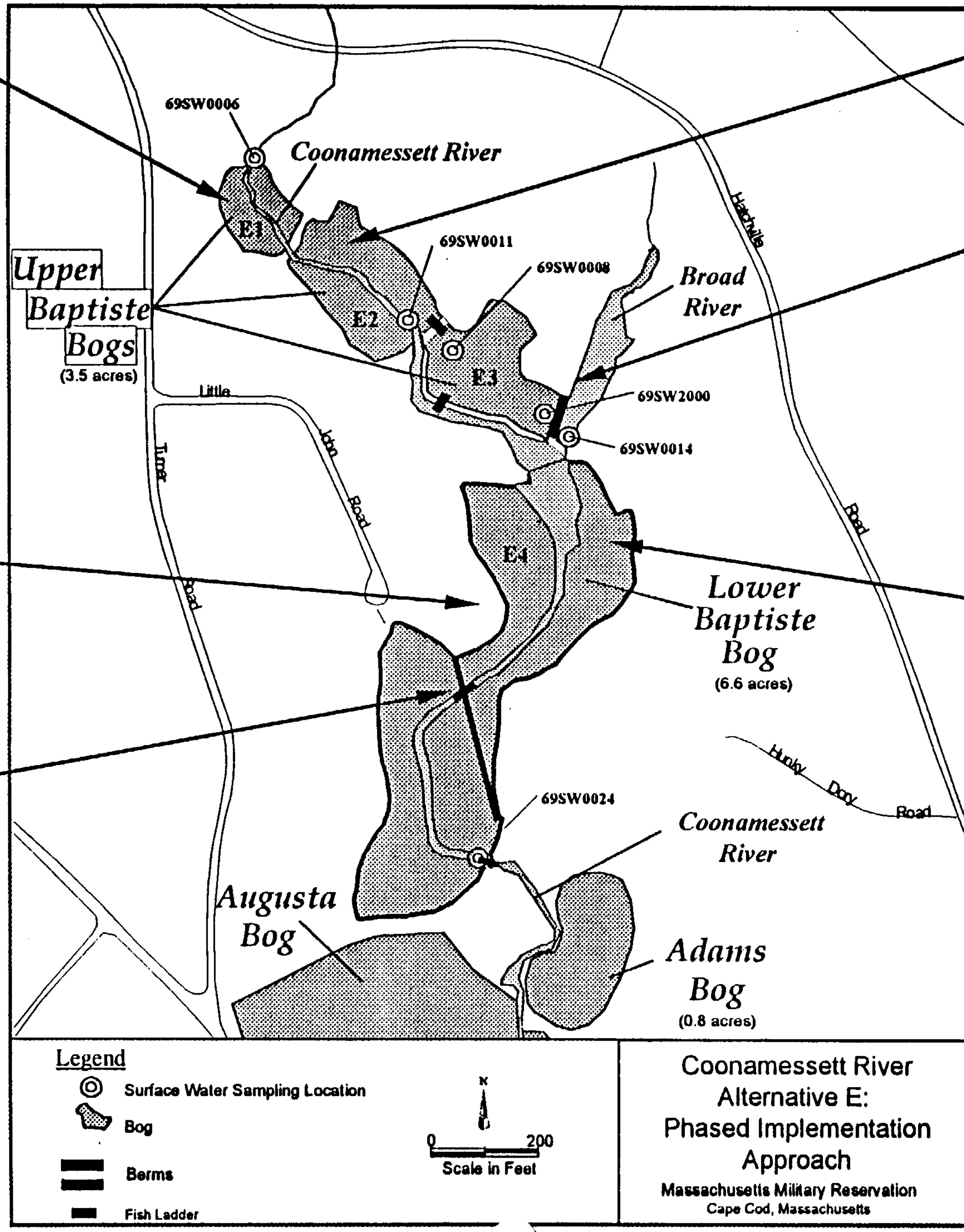
- Goal to decrease EDB concentrations 10-fold by Fall 99
- Install shallow well points in upper half of bog to capture upwelling
- Reduce EW-1 to 400 gpm
- Treat captured well point flow with remaining 400 gpm capacity at EW-1 plant

- Advantages
  - Little or no loss of cranberry bog
  - May accelerate removal of EDB
- Disadvantages
  - Need pilot test to design adequately
  - May not achieve 10-fold decrease with only 400 gpm
  - Need power source and additional piping to treatment plant

Upper Baptiste Bog (E1)
Surface Water Data Non-Detect, ontinue Collecting Surface Water ata, Berries Marketable in Fall 99

Upper Baptiste Bog (E2)
Surface Water Data Non-Detect, Continue Collecting Surface Water Data, Berries Marketable in Fall 99

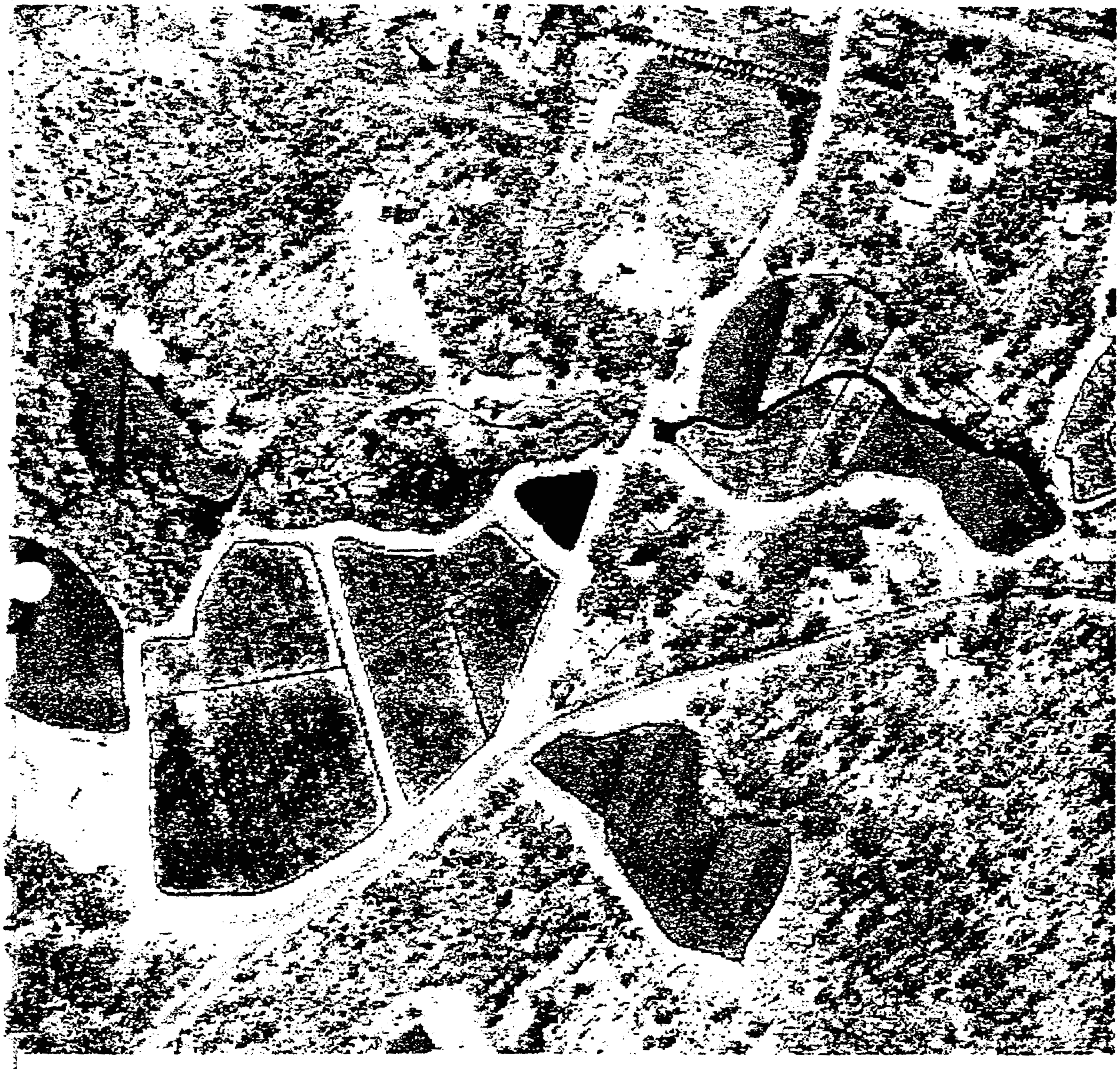
Upper Baptiste Bog (E3)
Berm East End of Bog E3 to Isolate From Broad River, Install 2 New Flumes, Continue Collecting Surface Water Data, Berries Marketable in Fall 00



Lower Baptiste Bog (E4)
Option #1
Develop the Entire Lower Baptiste Bog into a Holding Pond, Install a Fish Ladder at Station 69SW0024, Continue Collecting Surface Water Data

Lower Baptiste Bog (E4)
Option #2
Berm Laterally Across the Bog, Develop the Upper Half of the Lower Baptiste Bog into a Holding Pond, Install a Fish Ladder at the Berm-River Interface, the Lower Half Remains a Cranberry Bog, Continue Collecting Surface Water Data

Lower Baptiste Bog (E4)
Option #3
Install shallow well points in upper half of bog to capture upwelling, reduce EW-1 pumping to 400 gpm, treat captured flow with remaining capacity of 400 gpm at EW-1 treatment plant, Continue Collecting Surface Water Data



Alternative E - Phased Approach
Augusta Bog

Augusta Bog

- One year of non-detect data available for inlet at 69SW2001 and outlet at 69SW0060
- Provide alternate water source from Round Pond, Falmouth water main, intercept river upstream, or EW-1 outfall
- Remove 2 weirs to disconnect from river

- Advantages
  - Already separated from river
  - Provides clean water to bog
  - Cranberries marketable for Fall 99
- Disadvantages
  - Clean up UST spill near Round Pond
  - Boundary dispute near Round Pond
  - Jack pipe under road

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Alternative E - Phased Approach Adams and LaSalle Bogs

Adams Bog

- Berm and flume construction
- Provide alternate water source
- Non-detect data available above river connection
- Submit Notice of Intent

LaSalle Bog

- Berm construction
- Provide alternate water source
- Low level EDB concentrations in 69SW2014 and 69SW2005
- Submit Notice of Intent

- Advantages
  - Separates EDB from bog
  - Provides clean water
  - Cranberries marketable for Fall 99
- Disadvantages
  - Erosion control required due to proximity of berm construction to river

Alternative E - Phased Approach Chaston Bog

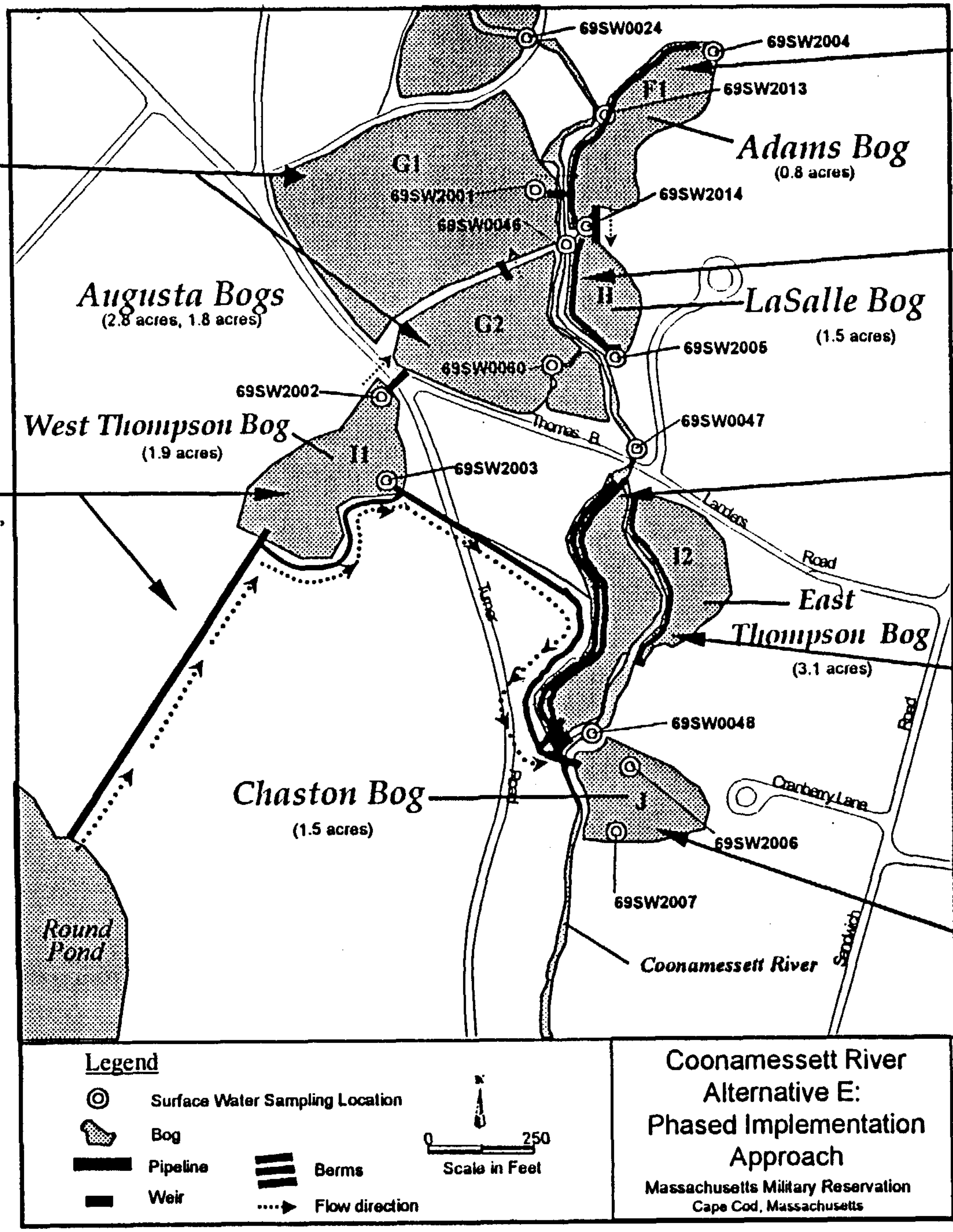
Chaston Bog

- One year of non-detect data available for 69SW2006 and 69SW2007
- Provide alternate water source
- Relies on West Thompson bog for hydraulic head

- Advantages
  - Already separated from river
  - Provides clean water to bog
  - Cranberries marketable for Fall 99
- Disadvantages
  - Issues related to providing alternate water source from Round Pond
  - Neighbor access issues

Augusta Bogs (G1 &G2)
Surface Water Data Non-Detect, Bog is Already Separated from River, Provide Alternate Water Source (Round Pond), Continue Collecting Surface Water Data

West Thompson Bog (I1)
Surface Water Data Non-Detect, Bog is Already Separated from River, Provide Alternate Water Source (Round Pond), Continue Collecting Surface Water Data



Adams Bog (F1)
Berm West Side of Bog to Separate it from the River, Provide Alternate Water Source (Round Pond), Continue Collecting Surface Water Data

LaSalle Bog (H)
Berm West Side of Bog to Separate it from the River, Provide Alternate Water Source (Round Pond), Continue Collecting Surface Water Data

East Thompson Bog (I2)
Option #1
Realign Channel to West Side, Install a Weir at the End of the Bog, Provide Alternate Water Source, Continue Collecting Surface Water Data

East Thompson Bog (I2)
Option #2
Berm East Side of River Channel, West Side Becomes Wetlands, East Side Remains a Cranberry Bog, Provide Alternate Water Source, Continue Collecting Surface Water Data

Chaston Bog (J)
Surface Water Data Non-Detect, Bog is Already Separated from River, Provide Alternate Water Source (Round Pond), Eliminate Water Loss From Bog, Continue Collecting Surface Water Data

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River

FS-28

Alternative E - Phased Approach
Reservoir Bog

Reservoir Bog
- Low level of EDB in 69SW2008 and 69SW0051
- Install a fish ladder at Pond 14 outlet
- Disconnect Flax Pond inlet to Pond 14

Option E1
- Install floating baffles in Pond 14 to increase detention time

Option E2
- Improve weir at Pond 14 outfall to raise water elevation ~0.5ft

Option E3
- Add plants in Pond 14 to reduce short-circuiting through pond

- Advantages
  - Improved fish pathway
  - No intrusive actions in bog
  - Cranberries marketable for Fall 99 if one year of non-detect data is collected
- Disadvantages
  - Issues related to raising water level such as impacts to bordering wetlands
  - Floating baffles may be difficult to install on borders

Alternative E - Phased Approach
Middle Bog

Middle Bog

- No action proposed
- Low level of EDB in 69SW0051 and non-detect data for 69SW0052

- Advantages
  - No changes to bog
  - Cranberries marketable for Fall 99 if one year of non-detect data is collected
- Disadvantages
  - None

Alternative E - Phased Approach
Lower and Flax Pond Bogs

Lower and Flax Pond Bogs

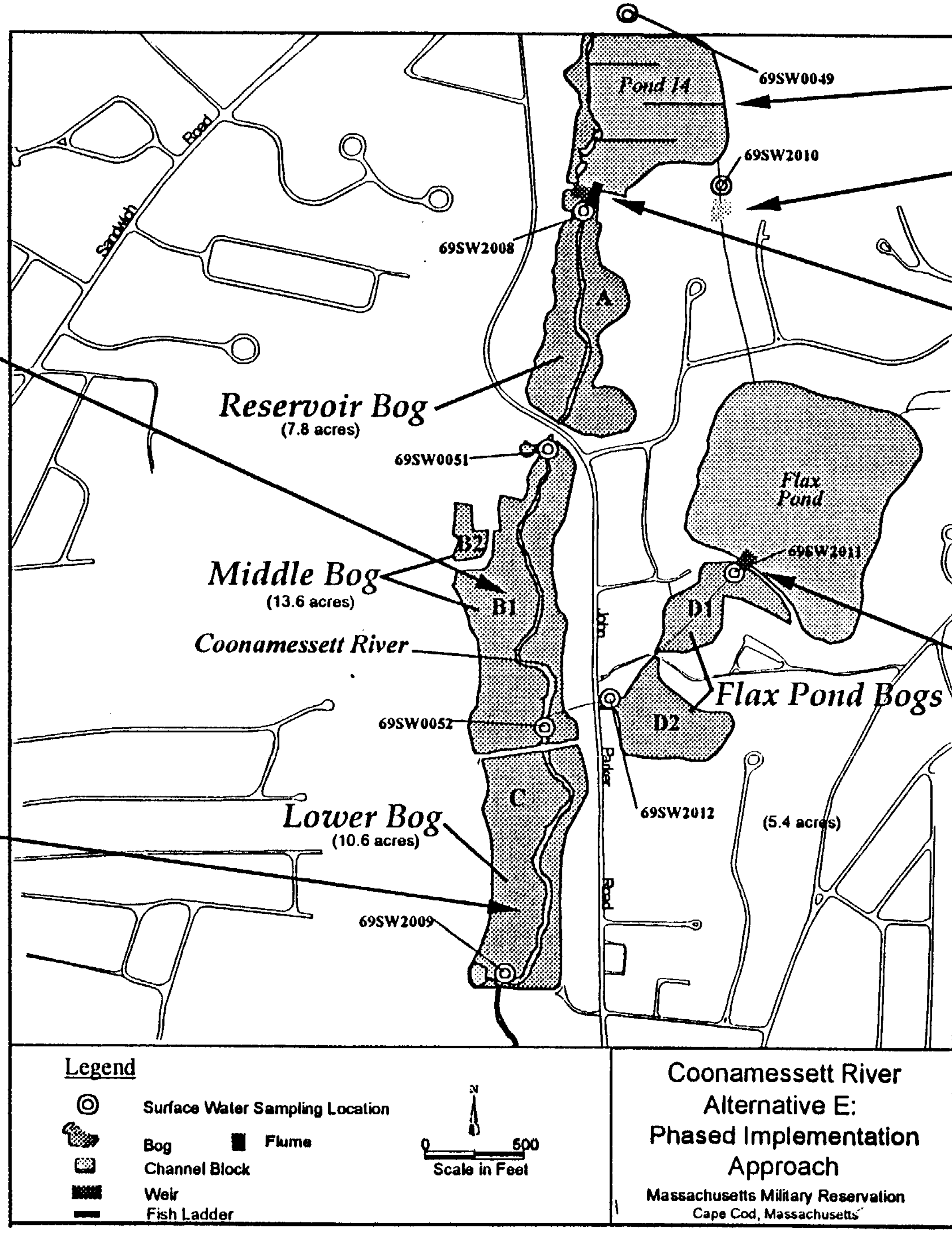
- No action proposed
- One year of non-detect data available for 69SW0052, 69SW2009, 69SW2011, and 69SW2012
- Test berries, if non-detect at Flax Pond bogs send to market

- Advantages
  - No changes to bog
  - Cranberries marketable for Fall 99 if berries test clean
- Disadvantages
  - None

Reservior Bog (A)
Option #1
Install floating baffles across Pond 14 (or plants) to increase detention time, Disconnect Pond 14 Outfall to Flax Pond, Continue Collecting Surface Water Data, Test Berries, Marketable in Fall 99

Reservior Bog (A)
Option #2
Install New Weir at Pond 14 outfall to Raise Elevation ~Half Foot, Add a Fish Ladder, Disconnect Pond 14 Outfall to Flax Pond, Continue Collecting Surface Water Data, Test Berries, Marketable in Fall 99

Middle Bog (B1 & B2)
Continue Collecting Surface Water Data, Test Berries, Marketable in Fall 99



Flax Pond Bogs (D1 & D2)
Improve Flume for Fish Pathway, Continue Collecting Surface Water Data, Test Berries, if ND Market FY98

Lower Bog (C)
Surface Water Data Non-Detect, Continue Collecting Surface Water Data, Test Berries, Marketable in Fall 99

Alternative E - Phased Approach Summary

- Phase I
  - Berm Baptiste Bog to isolate from Broad River
  - Provide alternative water source to flood West Thompson, Augusta and Chaston Bogs
  - Disconnect channel between Pond 14 and Flax Pond
- Phase II
  - Berm along Adams and LaSalle Bogs
  - Provide alternative water source for Adams and Lasalle bogs by pumping through Augusta Bog
  - Reduce concentrations in Pond 14 by installing floating baffles across the pond, or improve weir to increase elevation of pond 1/2 ft, or add plants to prevent surface water from short circuiting through the pond, and add new fish ladder

Phased Approach Summary (con't)

- Phase III
  - East Thompson by-pass channel or berm
- Phase IV
  - Lower Baptiste holding pond development
  - Install fish ladder

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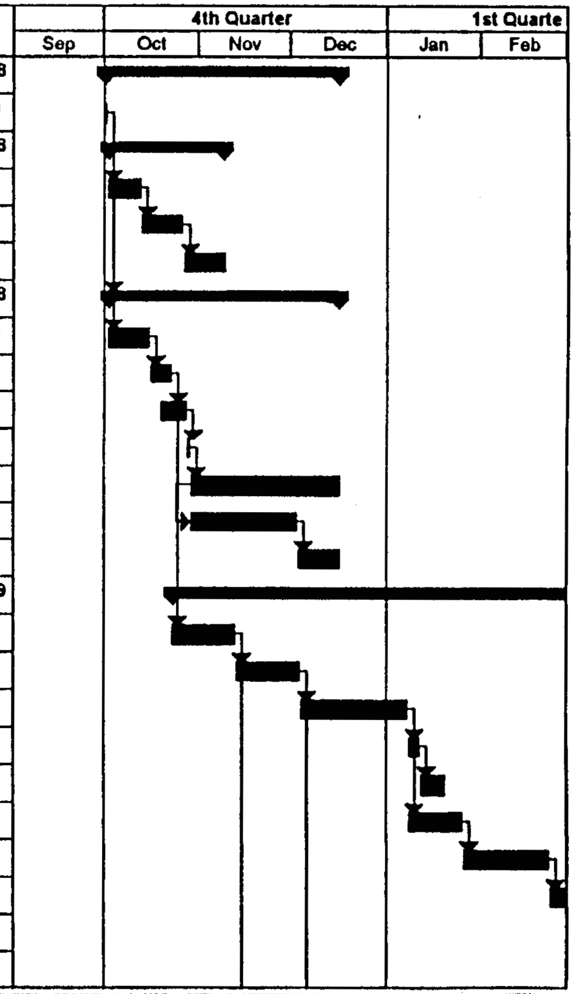
FS-28 Phased Approach Timeline

ID	Task Name	Duration	Start	Finish
1	Phase I - Upper Bogs	55d	Thu 10/1/98	Wed 12/16/98
2	Notice to Proceed	1d	Thu 10/1/9	Thu 10/1/9
3	Baptiste Bog Berm	27d	Fri 10/2/98	Mon 11/9/98
4	Prepare and Submit NOI	7d	Fri 10/2/9	Mon 10/12/9
5	ConCom Review	10d	Tue 10/13/9	Mon 10/26/9
6	Construct Berm & Flumes	10d	Tue 10/27/9	Mon 11/9/9
7	Round Pond Alternative Water (W.Thompson, Chaston, Augusta)	54d	Fri 10/2/98	Wed 12/16/98
8	Conduct Property Survey	10d	Fri 10/2/9	Thu 10/15/9
9	Prepare preliminary design	5d	Fri 10/16/9	Thu 10/22/9
10	Prepare and Submit NOI	7d	Mon 10/19/9	Tue 10/27/9
11	ConCom Review	1d	Wed 10/28/9	Wed 10/28/9
12	Construct pipeline & pumphouse	35d	Thu 10/29/9	Wed 12/16/9
13	Pipe UnderCrossing at Turner Rd	25d	Thu 10/29/9	Wed 12/2/9
14	Restore Site	10d	Thu 12/3/9	Wed 12/16/9
15	Phase II - Adams, Lasalle, & Pond14	95d	Fri 10/23/98	Thu 3/4/99
16	Prepare Preliminary Design	15d	Fri 10/23/9	Thu 11/12/9
17	Prepare and Submit NOI	15d	Fri 11/13/9	Thu 12/3/9
18	ConCom Review & Hearing	25d	Fri 12/4/9	Thu 1/7/9
19	Install Erosion & Sediment	2d	Fri 1/8/9	Mon 1/11/9
20	Construct Berms & Flumes	6d	Tue 1/12/9	Tue 1/19/9
21	Finalize Fish Ladder & Weir Design	12d	Fri 1/8/9	Mon 1/25/9
22	Construct Fish Ladder/Weir	20d	Tue 1/26/9	Mon 2/22/9
23	Restore site	8d	Tue 2/23/9	Thu 3/4/9
24				
25				



MMR
MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

Coonamessett

FS-28 Phased Approach Timeline (con't)

ID	Task Name	Duration	Start	Finish
17	Prepare and Submit NOI	15d	Fri 11/13/98	Thu 12/3/98
18	ConCom Review & Hearing	25d	Fri 12/4/98	Thu 1/7/99
19	Install Erosion & Sediment	2d	Fri 1/8/99	Mon 1/11/99
20	Construct Berms & Flumes	6d	Tue 1/12/99	Tue 1/19/99
21	Finalize Fish Ladder & Weir Design	12d	Fri 1/8/99	Mon 1/25/99
22	Construct Fish Ladder/Weir	20d	Tue 1/26/99	Mon 2/22/99
23	Restore site	8d	Tue 2/23/99	Thu 3/4/99
24	**Phase III - East Thompson Diversion**	**74d**	**Fri 11/13/98**	**Wed 2/24/99**
25	Prepare Preliminary Design	1d	Fri 11/13/98	Fri 11/13/98
26	Prepare and Submit NOI	15d	Fri 12/4/98	Thu 12/24/98
27	ConCom Review	10d	Fri 12/25/98	Thu 1/7/99
28	Install Erosion & Sediment	4d	Fri 1/8/99	Wed 1/13/99
29	Construct Bypass Channel	20d	Thu 1/14/99	Wed 2/10/99
30	Restore Site	10d	Thu 2/11/99	Wed 2/24/99
31	**Phase IV - Lower Baptiste Bog**	**62d**	**Fri 12/25/98**	**Mon 3/22/99**
32	Prepare and Submit NOI	15d	Fri 12/25/98	Thu 1/14/99
33	ConCom Review and Hearing	25d	Fri 1/15/99	Thu 2/18/99
34	Install Erosion & Sediment Trap	2d	Fri 2/19/99	Mon 2/22/99
35	Construct Berms & Flume	15d	Tue 2/23/99	Mon 3/15/99
36	Restore Site	5d	Tue 3/16/99	Mon 3/22/99
37				
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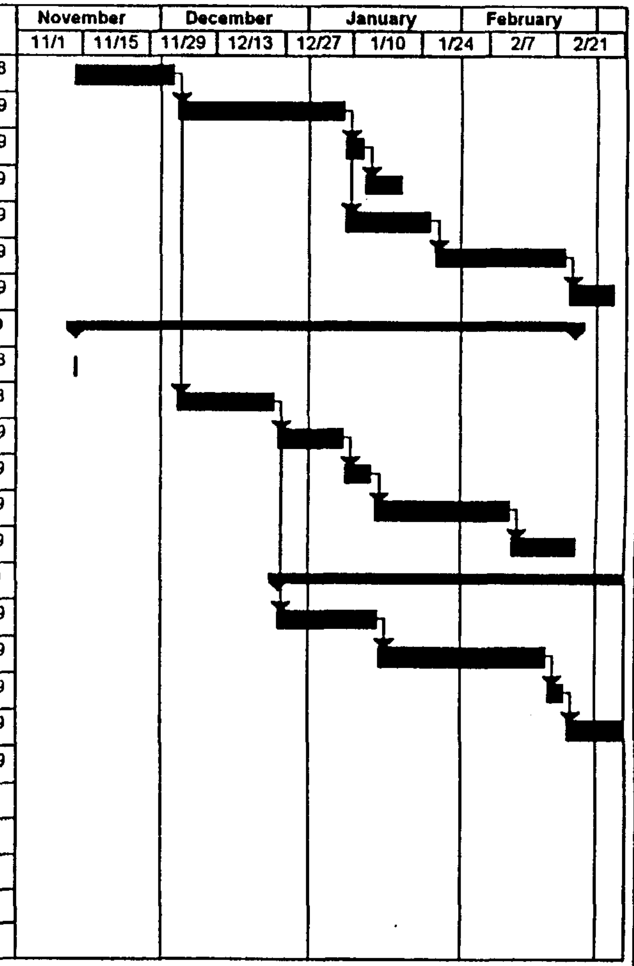
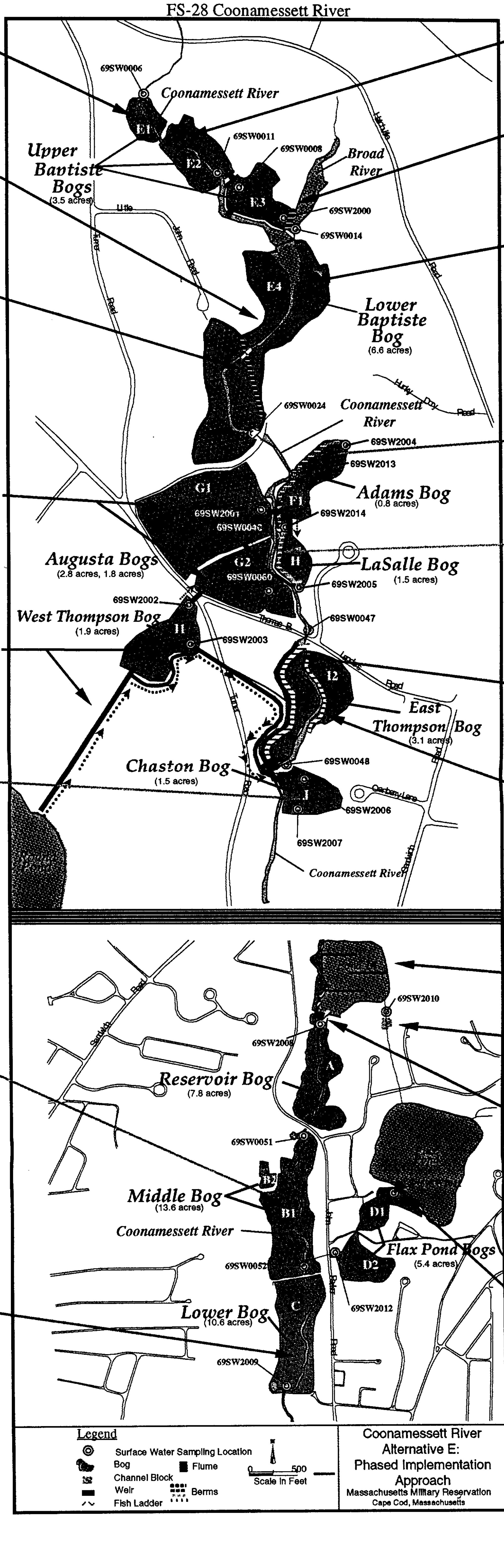
41				



FS-28 Coonamessett River



Upper Baptiste Bog (E1)
Surface Water Data Non-Detect, Continue Collecting Surface Water Data, Berries Marketable in Fall 99

Lower Baptiste Bog (E4)
Option #1
Develop the Entire Lower Baptiste Bog into a Holding Pond, Install a Fish Ladder at Station 69SW0024, Continue Collecting Surface Water Data

Lower Baptiste Bog (E4)
Option #2
Berm Laterally Across the Bog, Develop the Upper Half of the Lower Baptiste Bog into a Holding Pond, Install a Fish Ladder at the Berm-River Interface, the Lower Half Remains a Cranberry Bog, Continue Collecting Surface Water Data

Augusta Bogs (G1 &G2)
Surface Water Data Non-Detect, Bog is Already Separated from River, Provide Alternate Water Source (Round Pond), Continue Collecting Surface Water Data

West Thompson Bog (I1)
Surface Water Data Non-Detect, Bog is Already Separated from River, Provide Alternate Water Source (Round Pond), Continue Collecting Surface Water Data

Chaston Bog (J)
Surface Water Data Non-Detect, Bog is Already Separated from River, Provide Alternate Water Source (Round Pond), Eliminate Water Loss From Bog, Continue Collecting Surface Water Data

Middle Bog (B1 & B2)
Continue Collecting Surface Water Data, Test Berries, Marketable in Fall 99

Lower Bog (C)
Surface Water Data Non-Detect, Continue Collecting Surface Water Data, Test Berries, Marketable in Fall 99

Upper Baptiste Bog (E2)
Surface Water Data Non-Detect, Continue Collecting Surface Water Data, Berries Marketable in Fall 99

Upper Baptiste Bog (E3)
Berm East End of Bog E3 to Isolate From Broad River, Install 2 New Flumes, Continue Collecting Surface Water Data, Berries Marketable in Fall 00

Lower Baptiste Bog (E4)
Option #3
Install shallow well points in upper half of bog to capture upwelling, reduce EW-1 pumping to 400 gpm, treat captured flow with remaining capacity of 400 gpm at EW-1 treatment plant, Continue Collecting Surface Water Data

Adams Bog (F1)
Berm West Side of Bog to Separate it from the River, Provide Alternate Water Source (Round Pond), Continue Collecting Surface Water Data

LaSalle Bog (H)
Berm West Side of Bog to Separate it from the River, Provide Alternate Water Source (Round Pond), Continue Collecting Surface Water Data

East Thompson Bog (I2)
Option #1
Realign Channel to West Side, Install a Weir at the End of the Bog, Provide Alternate Water Source, Continue Collecting Surface Water Data

East Thompson Bog (I2)
Option #2
Berm East Side of River Channel, West Side Becomes Wetlands, East Side Remains Cranberry Bog, Provide Alternate Water Source, Continue Collecting Surface Water Data

Reservior Bog (A)
Option #1
Install floating baffles across Pond 14 (or plants) to increase detention time, Disconnect Pond 14 Outfall to Flax Pond, Continue Collecting Surface Water Data, Test Berries, Marketable in Fall 99

Reservior Bog (A)
Option #2
Install New Weir at Pond 14 outfall to Raise Elevation ~Half Foot, Add a Fish Ladder, Disconnect Pond 14 Outfall to Flax Pond, Continue Collecting Surface Water Data, Test Berries, Marketable in Fall 99

Flax Pond Bogs (D1 & D2)
Improve Flume for Fish Pathway, Continue Collecting Surface Water Data, Test Berries, if ND Market FY98

(6)

16 SEPTEMBER 1998 MEETING MINUTES, PRESENTATION HANDOUT

Falmouth Conservation Commission Meeting
Falmouth Town Hall, Falmouth
September 16, 1998
7:00 PM - 9:00 PM
Meeting Minutes

Attendees:	Organization:	Telephone:
David Potter	Falmouth Conservation Commission	
Allan Gordon	Falmouth Conservation Commission	508-548-7611
Joann Muramoto	Falmouth Conservation Commission	508-548-7611
Ms. Bryden	Falmouth Conservation Commission	
Mr. McLaughlin	Falmouth Conservation Commission	
Mr. Breivogel	Falmouth Conservation Commission	
Mr. Corriveau	Falmouth Conservation Commission	
Jan Selman	Pinecrest Beach Assn. for Round Pond	(508) 540-4586
Bob Lim	US EPA	(617) 223-5521
Brendan O'Hara	Falmouth resident	
James Quin	Foothill Engineering Consultants	(303) 278-0622
Maureen Sullivan	LWVF Observer	
Doug Karson	AFCEE	(508) 968-4678 x2
Paul Montague	Falmouth Herring Warden	(508) 457-2553
Una Shea	Pinecrest Beach resident	(508) 540-0351
Anthony Chiota	Falmouth resident	(508) 563-6348
Mr. Augusta	Cranberry Bog Owner	
Bruce Tripp	Falmouth Bog Subcommittee	
Nancy Balkus	AFCEE	(508)968-4670, x-4676
Tom Szymoniak	Jacobs Engineering	(508) 564-5746
Marty Aker	AFCEE/MMR	(508) 968-4670
Gail MacRae	Hatchville resident	
Brian McDermott	Falmouth resident	
Cheryl Holden		
Mr. Hayward		
Brian Handy	Handy Cranberry Trust	
Mr. Crooks	Ocean Spray	
Virginia Valiela	Falmouth Selectman	
Ms. Josephson		
Mary Meli	Operational Technologies	(508) 759-6989

Agenda Item #1. Overview and Summary of Past Events

The special public meeting to discuss remediation options for Town-owned cranberry bogs was convened at 7:07 PM by Mr. Potter, chairman of the Conservation Commission. Mr. Potter introduced Mr. Gordon, Chairman of the Town Bog Subcommittee, and turned the meeting over to him.

Mr. Gordon began his presentation by stating that the Town of Falmouth had 65 acres of cranberry bogs lying in the Coonamessett River Valley from Hatchville Road to Route 28. He noted that approximately 26%, or 14 of those 65 acres, were not affected by the Fuel Spill 28 (FS-28) ethylene dibromide (EDB) plume. He said that those bogs were still in production and therefore were not included in the discussion. However, there were three or four private growers with bogs in the Coonamessett River Valley, whose crops were affected by the EDB, and who would be impacted directly by this evening's decisions. He asked that the attendees reserve judgment until they had listened to all of the options as fully explained by the Air Force Center for Environmental Excellence (AFCEE).

Mr. Gordon then reported that, a year ago, Ocean Spray had stated that it would not purchase any products from the affected cranberry bogs until one year of non-detect data for EDB was available for the surface water associated with cranberry crop production. He explained that Ocean Spray had indicated that it may change that position. He then read to the group a letter sent by Mr. John Henry, Senior Vice President of Employee Relations and Chief Financial Officer for Ocean Spray to Mr. Jim Snyder, the AFCEE Remedial Project Manager (RPM):

> "Dear Mr. Snyder:
>
> I am following up on your presentation to members of our Board of Directors, in which you described AFCEE's proposal to construct berms along the Coonamessett and Quashnet Rivers in hopes of isolating nearby cranberry bogs from any EDB contamination. Let me start by saying that we appreciate the Air Force's continued efforts to resolve this situation. We want to work with you to achieve a fair and effective solution. From our perspective, there are two separate issues to consider in evaluating this proposal. First, will the plan work from a scientific and engineering standpoint and second, if the plan does work, would the creation of these channels alongside the cranberry bogs truly alleviate the public's perception issue at hand here.
>
> As to the viability of your proposal from a purely engineering perspective, I understand you will be sharing the technical details with a variety of experts and other interested parties during a series of meeting this week and next. While we certainly have experience in the area of cranberry bog development and water management, we are sure you understand that the scope and nature of your proposal is far different from anything we've ever encountered. We do not feel qualified at this point to make an absolute pronouncement as to the workability of this proposal. We look forward to hearing the experts' perspectives; and , to the persistent questions of crop marketability, we surely wish we could say with complete confidence that, if this remediation plan works and meets the standard of no EDB in the water for one year, we will be able to market the fruit. But the truth is, we do not have complete confidence at this point. The notion of those cranberry bogs, surrounded by special constructed channels, even if the water doesn't touch the cranberries, could very conceivably become a public perception problem in its own. Please understand we have not concluded that the public will reject this fruit, only that we need to take into careful consideration the possibility of similar perceptions and implications of your proposal. Beyond that, we will also need to reserve the right to measure public perception after the project is completed, as attitudes could shift the weight of public attention around the remediation work. As I believe Jeff LaFleur of the Cape Cod Cranberry Growers Association has emphasized, the obviously preferred solution here, one which I realize has been very difficult to achieve, would be to clean up EDB contamination by removing it from the waters before it reaches the cranberry areas so that you would not need to construct those bypass channels.
>
> We share with you the desire to have this issue resolved, but, in view of our continuing concerns, we could not in good conscience fully endorse the plan absent additional insight into its workability, both from engineering and public perception vantage points. We look forward to the group discussions this week and next and are ready to follow up with you on those issues."

Mr. Gordon said that he looked forward to further discussion of the issues.

Agenda Item #2. Presentation of Possible Remediation Options

Mr. Gordon introduced Ms. Balkus, the Cranberry Project Manager for AFCEE, and Mr. Szymoniak of Jacobs Engineering. Ms. Balkus expressed her appreciation to the Falmouth selectmen and the Conservation Commission for the opportunity to present the cranberry bog EDB contamination alternatives. She introduced Mr. Aker, the FS-28 project manager, and Mr. Karson, both of AFCEE, who she noted would also be able to answer any questions from the meeting attendees.

Ms. Balkus explained that the purpose of the meeting was to give AFCEE an opportunity to present alternatives being considered to address the EDB contamination in the cranberry bogs and also to give the public an opportunity to ask questions and address concerns. She noted that the goals of the presentation were to evaluate which alternative best resolved the EDB problem and met the community's needs and to eventually move toward a consensus decision at the meeting to be held on Monday, September 21, 1998.

Ms. Balkus noted that all of alternatives had been summarized on the meeting handout (see attachment #1). She stated that, when she was hired as the Bog Project Coordinator, her first task was to identify all of the stakeholders. Her second task was to identify all the issues raised by the stakeholders in order to ensure that any proposals put forth by AFCEE would address all of those issues. She noted that the stakeholders and issues were identified on page 4 of the meeting handout. Ms. Balkus stated that some actions had already been taken, and were ongoing, for the EDB response plan. One, an interim action under the CERCLA (Comprehensive Environmental Response, Compensation and Liability Act) process, was Extraction Well-1 (EW-1). EW-1 was removing a great deal of the plume that had emanated from FS-28. Also ongoing was the Southwest Operable Unit (SWOU) remedial investigation at the Massachusetts Military Reservation (MMR). She stated that the Bog/River Separation Plan, which specifically addressed the surface waters and cranberry bogs, would be the topic of discussion this evening.

Ms. Balkus stated that the goals of the Bog/River Separation Plan were two-fold: (1) to protect human health and the environment, and (2) to implement an action to return the bogs to production by the year 2000. She noted that Congress had given AFCEE two years of authority to get this action implemented. During this two-year period, the cranberry growers and towns would be compensated for not producing a cranberry crop. She also stated that one of the hardest parts of the project was to balance all competing interests, including the community's concerns, the cranberry industry's perspectives, the fisheries' concerns, the impact on wetlands habitat, the project time, cost, and risk, and, where possible, the minimization of that risk. She stressed that the project sought to balance every one of those components.

Ms. Balkus then presented an overview of the Coonamessett River bog system, as depicted on page 8 of the meeting handout. She pointed out the area of the FS-28 groundwater plume, which she said was very deep; she then traced the town and private bogs located downgradient of the plume, and continued southward from Pond 14 to the Reservoir and Lower bogs. She then turned the meeting over to Mr. Szymoniak who would explain the reasoning behind the alternatives.

Mr. Szymoniak stated that he had been involved in the project since EDB was first discovered in October 1996. Since then, 70 monitoring wells and the EW-1 extraction well, which was pumping 600 gallons per minute (gpm), had been installed. Surface water sampling was being conducted on a monthly basis, and AFCEE was conducting groundwater monitoring from 16 monitoring wells located at the leading edge of the plume, in addition to monitoring the performance of the extraction well. He said that these investigative activities provided the framework of a conceptual model. He also noted that a cross-section of the area under study was shown on page 9 of the meeting handout. The model, which conceptualized groundwater movement in the area, indicated that higher concentrations of EDB were located at Hatchville Road toward the conservation area. The lower concentrations were beginning to upwell and come into the lower bogs between the confluence of the Broad and Coonamessett Rivers. This upwelling caused the surface water to become contaminated at that point, from which it then flowed down river all the way to Great Pond. He noted that another part of the plume was deeper, and that more wells had been installed to define that. Mr. Szymoniak reported that, so far, only one well had shown EDB contamination; the other wells were non-detect. He said that the situation would be monitored to see if contamination concentrations were increasing in the area around monitoring well 1300 (MW1300).

Mr. Szymoniak stated that the modeling done for EW-1 predicted that the uncaptured area of the plume beyond the extraction well would be upwelling into the bogs for a period of 5 to 7 years. He noted that the well itself was capturing 100% of the plume above Hatchville Road; but the piece beyond the extraction well that had migrated before the well was turned on represented about 26% of the plume. He said that EW-1 would be in operation for about 10 years to clean up the plume itself and that there was still some

uncertainty because cranberry bogs have varying amounts of water flow. Mr. Szymoniak also mentioned that AFCEE was planning to conduct additional sampling and install two more monitoring wells to track EDB concentrations in the plume.

Mr. Szymoniak described EW-1 as an 8-inch-diameter well, about 210 feet below ground surface, with a 60-foot screen. He said that EW-1 had begun pumping on October 17, 1997, at about 780 gpm; the flow was since decreased to 600 gpm. He also noted that concentrations started in the well started out at 4.1 parts per billion (ppb) and that the federal drinking water standard or maximum contaminant level (MCL) was 0.02 micrograms per liter (µg/L). The level of influent at the treatment plant had subsequently dropped to 0.5 µg/L, while the effluent was non-detect.

Mr. Szymoniak stated that the surface water sampling has been conducted at several bog locations and at some sampling stations since October 1996. New stations were added in April of 1998 to monitor the actual individual influent and effluent of the bogs. He said that the highest concentrations were in the Broad River, at Station 14. The lower bogs showed concentrations that ranged from just below MCL to barely detectable concentrations, depending on the time of year. He noted that at this time of year the concentrations were barely detectable, so the trend was toward lower levels of EDB in the lower bogs. Since EW-1 went on-line, higher concentrations were seen at Station 14 at the Broad River, where the majority of the plume upwells. The lower concentrations were at Station 24, at the exit of the Baptiste bog, approximately 1000 feet downgradient from the confluence of the Broad River. Station 49, located before the entrance to Pond 14, was also a key station. Mr. Szymoniak also said that when the bogs were flooded, the concentrations going into Pond 14 were basically non-detect, which figured heavily into some of the remedial alternatives and how the flow of water may be controlled. He said that at Station 24, those low levels leaving the Baptiste bog were non-detect into Pond 14, which was probably due to a combination of two things: a lot of clean water ponding in the bog itself when the bog was flooded, and the stopping of the effluent, which changed the hydraulic gradient so that less could upwell into the bog itself. Mr. Szymoniak reported that therefore, one of the remedial alternatives being considered was to try to control this situation without affecting the fish migration.

Mr. Szymoniak then discussed quarterly groundwater monitoring at the Coonamessett River. He noted that the two monitoring stations were located immediately upgradient and downgradient of EW-1. He said that the high levels that the well was extracting were on the order of 10 ppb; downgradient of the well, at a different elevation and at different depths, the concentrations were in the vicinity of 0.1 ppb; the concentrations actually going into the pond were 0.7 ppb. Further downgradient was part of the uncaptured 26% that migrated beyond the extraction well before it was turned on, therefore the concentrations had remained about the same when the water was sampled and the wells were installed in November 1996. Mr. Szymoniak noted that decreases in the concentrations were expected and that more would be known with additional sampling and monitoring.

Mr. Szymoniak stated that there was a very sharp increase in the concentrations at the leading edge of MW1300. When all of the information was assembled and the groundwater modeling completed, it had been predicted that this portion of the plume would disperse. The data, however, tended to indicate that it was not dispersing, therefore another monitoring well would be installed upgradient to determine why these concentrations were increasing. The two wells immediately downgradient of this, 100 to 200 feet away, were non-detect, which indicated that the plume at this particular area was very narrow and very small. Mr. Szymoniak noted his belief that it would not upwell into the bogs themselves, but would tend to disperse out because of the tremendous amount of water in the system at that point. He then turned the meeting over to Ms. Balkus to discuss bog alternatives.

Ms. Balkus provided an overview of the data Mr. Szymoniak had discussed. At the upper bogs, approximately 26 acres were impacted. The three alternatives presented were: (1) buy out the bogs; (2) separate the bogs from the river and provide an alternate, clean water source; and (3) provide active or passive treatment. The alternatives to address the lower bogs, which had very low concentrations already and were not significantly impacted, were (1) dependent on actions taken in the upper bogs, where

contamination was upwelling; and (2) separate the bogs from the river to insure that EDB was not getting into the bogs and flowing down from them.

Ms. Balkus noted that EW-1 would continue to operate throughout all alternatives. She then described Alternative A as a buyout, which meant that the crop or the land, or both, would be bought, for an undetermined time period that depended on how long it took for the contamination to upwell. She noted that the model indicated that, in the upper bogs, it could take as long as 5 to 7 years for the leading portion of the contamination to upwell and go down to non-detect. For that period of time, the Air Force would continue to buy the crop as it had this year and would next year. The Air Force would also ask the growers to maintain the bogs, install controls to limit access, if necessary, and would continue sampling and monitoring. Ms. Balkus cautioned the group that on this particular alternative there was currently no legislative authority beyond calendar year 1999 for the buyout. However, she noted that this was still an option that needed to be evaluated.

Ms. Balkus again turned the program over to Mr. Szymoniak to detail the remaining alternatives. She also noted that Alternatives A, B, C, and D were the exact same alternatives that were presented at the FS-28 open house.

Mr. Szymoniak explained that Alternative B realigned the river to the Baptiste bog, which was divided into the upper and lower Baptiste bogs. He said that the contamination was upwelling in the upper Baptiste bog and that this alternative attempted to take control of these bogs and separate the fish migration pathway, starting at the beginning of the Baptiste bog and going all the way through the outlet. The channel in the upper bog would be lined to prevent EDB from upwelling into the new river channel; with no upwelling in the channel, it would be a clean alternative water source for the three private bogs. Mr. Szymoniak stated that Alternative B would also provide separation for the Adams and Lassalle bogs, with some storage capacity included. He noted that the storage basins would be kept at low levels, which would control flood conditions and the contamination itself. The alignment of the channel would be set up so that it would revert back to wetlands after the treatment. He also mentioned the advantages that the alternative separated the surface waters to control the upwelling, and the spring and fall herring migration pathway would be maintained.

Mr. Szymoniak then explained that there were two sides to a bermed channel: the interior and exterior. He said that the interior berm would be used by the bog operator for the actual remediation; the exterior, on the river side, would be the riparian zone. The disadvantage to the berms was the disruption of the current river channel. He also noted that because EDB would still be present in the river, and there was a possibility that the upper bog could have EDB, there was therefore a need for separation. The goal of this alternative was to reduce the concentrations ten-fold so that the concentrations going into Pond 14 would be non-detect. This would bring all the bogs back into production. The upgradient bogs would all be separated and alternative water would be provided.

Mr. Szymoniak went on to explain that Alternative C built on Alternative B by adding active treatment. Shallow groundwater wells would be installed to keep up with the contamination upwelling into the river and the treatment plant would be expanded from the current rate of 600 gpm to about 2,400 gpm. That water would be discharged at about four locations, so that the flow would be the same as what was entering the bogs. The shallow well points would be connected to a header system and the water would be pumped back to the top. Mr. Szymoniak noted that this alternative would require that power be brought in for the pumps. If power was lost, the lower baptoste basins would function as a backup. Basically, this alternative would get the concentrations to non-detect and, with the exception of the lower Baptiste, which represented about 6.6. acres, get all the bogs back into production.

Mr. Szymoniak noted that Alternative D was the same as Alternative B in that it relied upon realigning the channel. However, it also separated all the other bogs on the river system. He then referred to the letter from Ocean Spray and remarked that he felt that the key was to reduce the concentrations at Pond 14 to non-detect.

Mr. Szymoniak described Alternative E as a phased approach, which included the use of treated water from EW-1 as the alternative water source. He said that the water requirements were about 600 gpm, which was currently produced from the treatment plant. He also noted that a pipeline down to the Chaston bog was proposed to provide an alternative water source for the growers in that region; the purpose was to separate the upper bogs and provide alternative water. He noted that the striped lines on the Alternative E figure indicated the bogs that were not currently separated from the river. He suggested providing alternative water to those bogs that were already separated, and install berms on the Upper Baptiste (E3), Adams and Lassalle bogs. Two options were available for the East Thompson bog; one would include realigning the channel, possibly removing a weir, improving the fish channel and converting that part back into wetlands or a cranberry bog; the second would be to berm the east side of the river channel bog so that the west side of the bog became wetlands and the east side remained cranberry bog. There was still the possibility that EDB would remain in the river system with this alternative, but the goal was for Pond 14 to be non-detect. The water leaving Pond 14 would be clean and the lower bogs would come back into production. In order to accomplish that, a tracer test at Pond 14 would be necessary to determine how the water flowed. Mr. Szymoniak proposed using an abandoned cranberry bog near Pond 14 to improve the flow from Pond 14 and for getting more clean water to achieve non-detect at the outlet.

Mr. Szymoniak then noted that, as discussed in Alternative B, the Baptiste bog would have few, if any, alterations. He explained that in trying to keep the river where it currently was, there were two options to consider. One was to build a small pond at the beginning of the river, which would function as a mixing basin and help to add more clean water and lower contaminant concentrations. The second option was to add shallow well points, decrease the flow of EW-1 to 400 gpm and use the excess capacity to try to remove more of the mass of EDB that was upwelling. The goal would be to treat more of the shallow groundwater to achieve the ten-fold decrease discussed earlier. A pipeline would service all the other bogs. Mr. Szymoniak stated that this alternative had merit because, as a phased approach, it utilized what was in place and did not alter many of the current channels.

Ms. Balkus summarized the alternatives discussion for the group: (1) buy out the bogs or compensate for the crops; (2) separate the bogs and/or provide an alternate water source to provide winter protection and flooding for harvest; (3) provide treatment, either passively by providing a pond where the hydraulic gradient would be changed so that contamination would not be allowed to upwell, or actively, by installing shallow well points which would pull out shallow groundwater and treat it at EW-1. Ms. Balkus reiterated that the focus was on treating the upper bogs and getting Pond 14 to non-detect so that no action would be necessary at the lower bogs.

Ms. Balkus then discussed which response actions were easier to implement and those which were more difficult to implement due to the uncertainties associated with them. She said that the Upper Baptiste bogs, E1 and E2, were already clean, however the Upper Baptiste bog, E3, would need to be separated from the Broad River, which was where some of the upwelling was occurring. The Adams and Lassalle bogs would also need to be separated from the river. The Augusta, West Thompson and Chaston bogs were already separated from the river, but needed a clean source of water in order to return to production. She remarked that the two alternatives for the East Thompson bog were more difficult. The river channel could be relocated, or it could be left where it is and bermed on the east side, but the whole cranberry bog would not be separated from the river. The proposed treatment option would take place at the Lower Baptiste Bog, either passively by ponding the water, or actively by installing extraction well points.

Mr. Potter asked if it was correct that one of the options included the installation of shallow well points in the lower Baptiste bog to collect part of the plume that escaped EW-1 capture. Mr. Szymoniak stated that this was correct. He explained that there were two options with Alternative C, installing the well fence and using the capacity of the treatment plant without realigning the channel, or pumping a much larger volume and moving the river out. Mr. Potter asked, if the shallow well points were to be used, whether the treated water at EW-1 would be decreased in order to accommodate water withdrawn from the well points. Mr. Szymoniak replied that this was correct and added that there would be a remaining capacity of about 400

gpm.

Ms. Muramoto asked if Alternative B was essentially the first part of any of the alternatives. Mr. Szymoniak clarified that this was only the case with Alternatives C and D.

Mr. Corriveau noted that the demands on the water source would be for the lower bogs. He asked whether those bogs would be able to use Pond 14 again in the future. Mr. Szymoniak replied that if Pond 14 returned to non-detect, it could be used as a source again, however he felt that it was premature to say.

Ms. MacRae suggested that it would be better to determine how the contamination was entering the cranberries before putting millions of dollars into plans to separate the bogs from the river system. Ms. Balkus reported that research studies would be underway shortly at Kansas State University (KSU) to determine how the contamination enters the cranberries. One study, which involved floating cranberries in water with varying amounts of contamination, would evaluate if EDB could enter the skin of the fruit. The second study involved growing a plant in a controlled environment to determine whether or not the roots and vines could uptake the EDB and eventually contaminate the fruit. She also noted that testing was done on berries last year with some varying results; the Air Force samples had shown no contamination in the berries, but the Massachusetts Department of Health (MDPH) results had shown that there was contamination. It was anticipated that the KSU studies would provide more definitive results. Ms. Balkus also mentioned that literature was available on studies where other types of fruits and plants were not contaminated by EDB, however, to date, there was nothing on cranberries.

Ms. MacRae questioned why these studies were not done three years ago. Mr. Szymoniak reminded her that when the bogs were flooded, the values were non-detect.

Mr. Adams remarked that there had not been any detectable EDB in those bogs before 1996. Now that there was treatment, 85% of the tests showed clean water. He felt that anyone with any knowledge of plant pathology would assume that EDB would not enter the plant. Although he felt that the study may be a waste of money, he believed that it was worthwhile for people to get their questions answered.

Mr. Gordon noted that two weeks from now would be the second anniversary of the discovery of EDB in the bogs and added that, although it may not seem so, much had learned about the situation since that discovery.

Mr. McDermott commented that he was mystified as to why it was imperative to grow cranberries. He noted that the towns' total investment in the bogs was $87,500; this was what the towns were paid. Given all the problems, Mr. McDermott remarked that it did not make sense to grow cranberries when not growing them meant having a healthy river system with fish and other aquatic life unaffected by cranberry bogs. He further stated that it was known that pesticides were going into the river because these were flow-through bogs rather than the more traditional bogs where the water was dammed. He stressed that he honestly did not see the advantage, given the towns' investment of $87,500. He then remarked that upward of $6 million was being considered to treat the contamination, with no guarantee that the treatment would work. He asked that the town consider his comments.

Ms. Holden noted that there were a couple of issues to consider regarding the KSU studies: (1) the movement of EDB into the cranberries and then out again, and (2) whether there was bioaccumulation. She said that these studies may have some bearing on what was ultimately done, but that they did not happen overnight, particularly the translocation and bioaccumulation issues. She questioned the wisdom of waiting two years until the study results were in and doing nothing in the meantime.

Mr. O'Hara asked how much money was spent last year to reimburse the growers for their losses. Ms. Balkus replied that $800,000 were reimbursed to the towns of Mashpee and Falmouth. Mr. O'Hara asked if it was correct that while the remediation alternative could run up to $6 million, nothing could be done to the bogs and the growers could be reimbursed, with legislative approval, for $5.6 million. Ms. Balkus

replied yes, that was one of the alternatives, Alternative A, the buyout.

Mr. O'Hara expressed his concerned about the potential public perception problem described in the letter from Ocean Spray. He then referred to the upheaval associated with the construction of any of the treatment systems and asked why it would not be better to take a "wait and see" approach. Mr. O'Hara remarked that he saw no sense in going through the remediation process when it was quite possible that the growers would have to be compensated anyway, if Ocean Spray would not buy their crops.

Mr. Montague commented that the best thing for the fish would be a buyout process because it would allow the river to go back to as natural a state as possible. However, if the town fathers felt that the town bogs should continue in the production of cranberries, then he thought that Alternative D should be considered. He said that the best thing for the river and the cranberries is to separate the two as much as possible. He noted that he personally leaned toward Alternative A, but did not feel that it was "his call."

Mr. Chaston stated that he was a cranberry grower and wanted to continue to grow cranberries if it could be done fairly and a good clean crop was the result. He then asked if the pipes coming down from the well above would be pumped or would rely on gravity flow. Mr. Szymoniak replied that they would be pumped.

Mr. Hayward questioned why buying out the most impacted properties and remediating the ones left was not being considered. He said that it did not seem to him that it should be an either/or proposition. Ms. Balkus said that this was what Alternative E would try to do. Mr. Hayward suggested that one or two bogs could be bought and to "not fool with the rest of them."

Mr. Corriveau asked how Mr. Hayward might feel if someone came into his backyard where he had been growing tomatoes for 15 years and wanted to buy out his farm. He remarked that it was not easy to let go of something like that. Mr. Hayward replied that if the price was right, he would be happy to let go.

Mr. Adams commented that it was a very good point that point below Pond 14 was the biggest source of the income from the bogs. He said that the cranberry growers all had something to lose, but that Mr. Handy and the Town of Falmouth had the most to lose. He felt that with any plan the growers should come out on top, or at least on an equal platform. He also said that he took exception to Mr. McDermott's comment and he asked "$87,500 times how many years?" He said that he was proud of the appearance of the town and remarked that cranberry bogs were part of Cape Cod. Mr. Adams wondered whether Mr. McDermott was willing to lose one-third of his income and noted that this was what Mr. McDermott was asking Mr. Handy to do. He noted that his own income was supposed to send his kid to college this year. He also said that Mr. McDermott would say that there would be money from the government. He then asked Mr. McDermott if he knew how much money the growers had actually seen from the government. He said that it was very little compared to his lifetime investment, which was to go to his children, and his children's children. He noted that Mr. Handy's family has been here for five generations and he has been here a while himself and had seen many changes in the town.

Mr. Gordon agreed that the cranberry bogs held a very important "sense of place" to many people in the town.

Mr. Tripp remarked that having heard the details of the alternatives, it was time to make a recommendation to the Air Force about where the town would like to be headed in this process. He said that he did not want to "close any doors too tightly" because there were still some questions that had to be answered; we suggested making a "soft" recommendation rather than a "hard" recommendation, so that it could be tweaked along the way. He suggested a recommendation that would incorporate continued tweaking. He stated that the Board of Selectmen and the Bog Subcommittee had been interested in the pre-EDB bog operation and were also interested in the public perception that there were nutrients and chemicals leaking from the bogs. He said that the town had been looking at some system that would move the river away from what it had become in the past 200 years of cranberry bog operation; making it more of a natural

system which separated the bog operations so that the bogs could retain water when chemicals were applied in order to avoid any impact to the river.

Mr. Tripp remarked that a combination of Alternatives B and D would mean dealing with the EDB in the ponds that would be created and separating out the entire length of the system of day-to-day bog operations from the natural system. He said that he hoped that this would prevent impacts to the fish. If a natural system could be reestablished, the herring could pass without having to "fight" with the bog operator about water levels. He said that it seemed that a combination of Alternatives B and D would be headed in that direction, the direction in which the Bog Committee was headed before the EDB was discovered.

Mr. Tripp commented that Jacobs Engineering had done some of that work for the Committee, but had done it while wearing "engineering blinders" and "EDB blinders." He said that input from wildlife and wetlands biology perspectives was needed, in addition to the input that had been received so far, in order to make a recommendation that allowed for that continued interaction. He felt that the focus on the cost should not pertain only to the the capital investment and the maintenance for these alternatives, but on that "sense of place." He reiterated that value should be considered not just in terms of economics, but in terms of emotional value, historic value and cultural value. He wondered how one could determine the value of the open space adjacent to the cranberry bogs or the natural wetland system that was draining to the cranberry bogs. Mr. Tripp said that he imagined that some cranberry bogs would be lost with some of these alternatives, and that would be an adjustment that would have to be made. He then emphasized that there were values that went beyond simply the dollar values of these alternatives; he said that focusing only on dollar value was "missing the point."

Mr. Chaston stated that although he was only a small grower, the military had not treated him fairly in terms of compensation. Therefore, he did not feel very receptive to the idea of selling his bogs to the Air Force, unless he was going to be treated better than in the past.

Mr. Potter asked Mr. Handy what he thought about the Ocean Spray letter. Mr. Handy replied that even if the bogs were non-detect, the public perception may not be good. He said that initially he was upset to hear some of the reactions. He noted that the letter indicated that Ocean Spray did not have a good level of confidence in simple river diversion, because there may still be contamination in the bogs. He said that Ocean Spray was looking for non-detect and this would involve treatment or something going on up above; simple river diversion would not achieve that.

Mr. Crooks stated that the berries from those bogs were very marketable prior to EDB, and he fully expected that, when the EDB was gone, they would be marketable again. However, he said that in this world there were two certainties: death and taxes. Therefore, he could not unequivocally say that the berries would be marketable. He noted that it was not known if the solutions proposed in the alternatives would work. However, if the EDB was gone, that fruit would be marketable fruit. Mr. Crooks further stated that when the letter was written, none of these options were known, and it could not be predicted which way things would go. He said that obviously the situation was more complex than anyone had envisioned at the time. Therefore, Ocean Spray had to qualify that and state that there was not a guarantee. He reiterated, however, that if the EDB was gone, he could not see why that fruit would not be marketable again. He concluded by saying that Ocean Spray needed products in which consumers had confidence.

Mr. Gordon asked Mr. Handy if he had any thoughts on this. Mr. Handy replied that he saw the treatment with shallow well points as part of the process. He said that he realized that part of the Baptiste bogs , or possibly all of the Baptiste bogs, would be sacrificed as part of the solution to clean up Pond 14. He noted that the private growers must be considered and that he hoped that if treatment were done up above, that the private growers would get clean water too.

Mr. LaFleur stated that everyone wanted to see the plume cleaned up and that it seemed that there were some options here tonight that would assist in that. He felt that the shallow well points and continued operation of EW-1, possibly in combination with Alternative B, may be a viable option and may actually

generate a win/win proposal for the town, the growers, and the fish.

Mr. Tripp commented that Alternative C seemed to be a huge engineering project with maintenance required for some unknown future time, which was much bigger than anything with which he could feel comfortable. He then asked if the bogs would be replaced with ponds in Alternative C. Mr. Szymoniak replied that the ponds would still be there. Mr. Tripp asked if the ponds could be built first and it could then be determined how much treatment would occur passively. Mr. Szymoniak replied that, basically, this was what was involved in a phased operation.

Ms. Valiela encouraged the group to weed out the things that were found to be unacceptable and keep those on which there was clearly some consensus. Regarding the shallow well points, Ms. Valiela remarked that this was an extraction and treatment function which would get some of the rest of the EDB that was not caught by EW-1. She also noted that there would be less EDB downstream and that the wells would aid in achieving the non-detect goal at Pond 14. She said that she was in favor of the shallow well points. She also noted that a 5 to 7-year period was modeled and was the time frame to "get through" the EDB. She said that the long-term revenues from these bogs for the private owners and the Town of Falmouth would have to be considered.

Mr. Mack said that he was concerned about the intrusive pipes above the ground, the wiring and so forth. He was also concerned that some of the ponds would be taken out of the Baptiste area and he was very much concerned about altering the water table. Ms. Valiela noted her understanding that, once the choices were narrowed, there would be a Notice of Intent to the Conservation Commission on the plan that was developed and the implementation of that plan. She stated that at such time that there was a concrete plan before the Board, it would then be appropriate to bring before the Board issues of how the neighborhood should look.

Ms. Selman questioned why, since there was a 7-year cleanup time, some of the bogs were not relocated. She noted that there were two years that crops could be purchased. She suggested that if an area in the town could be found to relocate the bogs, the growers could be paid off, the bogs, estuaries and river system could be cleaned up, and the EDB could be treated rather than suppressed. She noted that when the EDB levels dropped, the growth there could be reestablished, thereby increasing both the crop and the income. She felt that this was a possibility and noted that the government had moved entire communities affected by contamination; she did not see why the government could not move bogs.

Mr. Gordon asked how long it takes to establish a bog. Mr. Handy replied that to get into production took close to 5 years. He said that moving the bogs was an interesting idea, but he hoped that a plan would come together that would take a lot less than 5 years.

Mr. McDermott noted his belief that the lease for the Handy bogs would expire in the year 2004. He said that someone else would bid on the lease or the town may decide to consider other options.

Ms. MacRae commented that while she understood that her neighbors who grow cranberries had taken a loss, the local residents had been impacted and taken losses as well. She explained that the reality was that the residents had lost property value. She said that the people in the cranberry industry had done damage to her land and her home. She noted that when she had moved to her home, the Baptiste bogs were not even in existence, therefore these bogs had greatly impacted her property. She also pointed out that the people in her neighborhood were now faced with the prospect of dealing with a treatment plant. She asked that the town consider not only the cranberry growers, but the residents in the area as well as their investments. She remarked that she had lost her dream as well.

Ms. Muramoto asked what progress had been made in the storage of treated water. She said that she understood that consideration was being given to storing treated water in the event that bogs needed to be flooded with clean water. Mr. Szymoniak replied that there was a possibility of putting in a 1.5 acre pond that would provide treated water for some bogs, however this was only a conceptual idea at this point.

Mr. Montague asked if the cost sheet (see attachment #2) included any annual maintenance and operation at EW-1. He also asked if these costs were for the entire 5 to 7 years. Mr. Szymoniak replied that the operation and maintenance costs of EW-1 were built in to treatment figures, however he was unsure if the wellhead treatment in option C2 had all the costs of EW-1 figured into it.

Mr. Tripp asked if the channel would be realigned for the $6 million. Mr. Szymoniak replied no, and explained that the channel realignment included expanding the treatment plant to 2400 gpm, which would triple its size from the current operating capacity. Mr. Tripp asked how much that would cost. Mr. Szymoniak replied that the treatment plant, tripled in size, would probably be a $4 million investment. He added that about 9 million gallons per day were currently being treated.

Mr. Tripp reminded the group that when it comes to cost, the real numbers can come in within 10 to 15% of what was voted on, as was the case of the school that was voted on at the last town meeting. He said that this cost sheet had not existed last week, and it was generated to answer these kinds of questions. However the sheet did not provide the kind of cost estimates that one would get once an alternative was chosen. He further noted this hope that when looking at these costs, the group would not look just at the spreadsheet, but at the sense of place and history and the historic and cultural value of the bogs and the adjacent land. He said that these values had to be incorporated into the cost evaluation in this case.

Ms. Holden stated that there was value in natural wildlife habitat also. She said that any increase in wetlands or restoration of wetlands increased that value. She also said that these values were very difficult to factor in because there was not a good accounting system at this point. However, she felt certain that everyone, particularly the Conservation Commission, should take these values into consideration.

Mr. Gordon stated that his personal view was that whether cranberries were grown for 5 or 500 years, the Air Force should restore the property to its full economic potential, which existed prior to the discovery of EDB. He noted that the group must arrive at this value by consensus.

Ms. Bryden commented that if was truly the goal, then the choice could not be one of these alternatives. She noted that some people favored Alternative A, a buyout. However, she felt that certainly part of the uncaptured EDB plume could not be allowed to continue to downstream, therefore a shallow well point extraction treatment and channel realignment were warranted. She also mentioned the concern for the fisheries, which meant that consideration would have to be given to separating the bogs from the river. Ms. Bryden stated that the total, according to the figures provided, would probably be about $8 million or more. She also mentioned the value of the wildlife, which she said was difficult to determine in terms of numbers. She said that in order for the town to reach consensus, a number of alternatives would have to be implemented.

Mr. Gordon inquired about the permitting process. Ms. Balkus replied that tonight's discussion led her to believe that Alternative E was not very satisfactorily presented. She said that frankly, Alternative E was AFCEE's attempt to combine the best parts of Alternatives A, B, C and D. She reiterated that there was no EDB in E1 and E2, the two upper bogs. In E3, there was a low detection along the bottom of the bog where the Broad River comes up against it, which was why the Air Force proposed to put a berm there to separate the bog from the river. She also noted that in the Lower Baptiste bog, which was a big area of contamination, there were three possible options: active treatment, or well points in the area; or passive treatment with a small pond of about 3 acres; or the entire area could be utilized with an approximately 6-acre pond. Ms. Balkus noted that some of the wetlands and fisheries areas could be addressed this way as well, because the creation of the ponds may attract wildlife or generate a wetlands area.

Ms. Balkus noted that the Augusta bog was already separated from the river; only clean water had to be provided there. The clean water, from EW-1, would be piped to the area. The Adams and Lassalle bogs needed to be separated from the river; it was proposed that this separation be accomplished by berms.

Clean water would be provided to the bogs by the EW-1 pipeline as well. She noted that the West Thompson bog was already separated from the river, and that a clean water supply would be delivered to the bog from the EW-1 pipeline. Ms. Balkus remarked that there were a couple of different options for the East Thompson bog. Because of the fishery aspect, the river would be rechanneled to the western side, which would give the river free flow through that area. Also, the weir that was currently there would be taken out, which would allow the fish to pass more easily. If it was found to be unpalatable from a wetlands perspective to relocate the river, AFCEE would propose leaving it where it was. She noted that a portion of the cranberry bog operation could still be preserved and the western side could be developed into wetlands or a pond, whatever would suit the community.

Ms. Balkus stated that the Chaston bog was already separated from the river and just needed a clean water supply, which could be provided by the EW-1 pipeline as well. She said that whatever treatment was provided above Pond 14 would be designed so that by the time EDB got down to Pond 14, it would be non-detect. She said that it was hoped that nothing would need to be done to the bogs below Pond 14 because there would be no contamination, and the bogs could continue operating.

Mr. Augusta remarked that he would like to see the separation near the fish channel. He said that he realized that berming protected the bogs from the fish channel, but he felt that it did not take care of the fish transportation problem. He noted that he would like to see the inclusion of the berming that was proposed in Alternative E, however, he was concerned that the fish pathway was not completely isolated in Alternative E.

Mr. Gordon again inquired about the permitting process. Ms. Balkus explained that AFCEE was currently in the process of trying to reach a determination as to which particular process this project would follow. She said that it would probably not fall under the CERCLA Superfund process, but there was no final conclusion. If that were the case, the project would be handled similar to other Superfund projects but also pursue permits. It would include a Notice of Intent which would be submitted to the local Conservation Commission, the MA DEP, and the US EPA. The regulators would look at the alternative, evaluate it and determine, from a wetlands perspective, whether or not the alternative was being protective. If the regulators decided that the wetlands were not being protected, they would examine what mitigation was being proposed and whether or not that was acceptable. The fisheries perspective would also be taken into consideration. She said that the regulators would have to look at all the alternatives and determine whether they made sense from a regulatory standpoint. She reported that if the project did not fall under the CERCLA process, even more permitting requirements would have to be followed. Under CERCLA, it was necessary to meet the substantive requirements of the law; under non-CERCLA, it was necessary to fill out a permit. She explained that under either process, there were significant levels of regulatory oversight, review and authorization to ensure that any potential impacts were considered and addressed.

Mr. Montague noted that he relied on the water coming from Pond 14 to drive the Flax Pond herring run, and was therefore concerned about disconnecting the connection between Pond 14 and Flax Pond. He said that, if isolated, there would be problems in providing enough water to allow the fish to pass, even if improvements were made to the flume at Flax Pond. He said that this should be investigated before that option was considered. Ms. Balkus explained that the reason for the cutoff was to ensure that in the event that non-detect could not be achieved above Pond 14, nothing would be going into Pond 14 which could impact Flax Pond, which was clean.

Mr. Tripp suggested that if the recommendation included the goal of having a stream that was as "naturally flowing" as possible, where there did not have to be competition between herring and cranberry bogs, perhaps exactly how that would be done would not have to be addressed. Regarding permitting, Mr. Tripp noted that there had been a meeting in Lakeville where it was said that the CERCLA decision would be made by August 1. He asked Ms. Balkus if she had any idea as to when that decision would now be made. Ms. Balkus replied that the matter now rested with the attorneys.

Regarding permitting, Ms. Muramoto commented that there were portions of all the options that may be

exempt from normal wetlands permitting. She said that the Wetlands Protection Act did address normal maintenance and improvements. She also noted that the project may involve activities and/or structures which may not be subject to the Act, providing those activities followed certain definitions. She said that some areas of the alternatives could be problematic for wetlands; the issues were pretty complex. Ms. Muramoto felt that a meeting should be held to discuss regulations further as they pertained to the proposed alternatives. She then asked if it was true that there was an effort to schedule a meeting with regulators to talk about permitting. Ms. Balkus replied yes, the Air Force was trying to set that up after the Monday meeting. She explained that the benefit was that alternatives could be narrowed down and the exact permitting process could be discussed. Once the decision was made, the design would be done. At that time the Air Force would know the exact path the permitting would have to follow.

Mr. McLaughlin asked if there was a timeline and what was the dollar amount of the legislative appropriation. Ms. Balkus replied that the timeline was two years. Mr. McLaughlin remarked that $800,000 had been paid out, some to Mashpee, some to Falmouth. He asked what dollar amount was authorized. Ms. Balkus replied that in 1997, it was an $800,000 authorization. Mr. McLaughlin asked if this authorized compensation to both private growers and the towns for easement. Ms. Balkus replied that it did. Mr. McLaughlin asked if this meant that the Air Force could lease these lands and simply take some of the bogs out of production. Ms. Balkus explained that the compensation and authority pertained to the cranberry crop itself, not to the land. She added that it was not the intent of the Air Force to sublet the land or to do anything else with it, aside from the crop aspect. Mr. McLaughlin stated that the Air Force was then buying the crop. Ms. Balkus agreed that this was so.

Mr. McLaughlin commented that Alternative E sounded like a good consensus for the beginning. He noted that the growers had been asked to flood the bogs and destroy the blossoms, in anticipation of being compensated, and this had been done. He noted that a question for the bog owners was whether EW-1 discharge treated water was acceptable to them for irrigation and flooding. Mr. Chaston replied that for him, it was. He also noted that he had more to say when Mr. McLaughlin was finished.

Mr. McLaughlin explained that he was trying to make a separation here between the Lower Baptiste and those bogs above it which were the town bogs; the private growers were farther down. He asked, if clean water or treated water was provided for a year, whether that would be acceptable to Ocean Spray. Mr. Crooks replied that the public perception at that time would have to be considered. He said again that if there was nothing in the water, he did not see why there would be a problem.

Mr. McLaughlin proposed the following question: should a recommendation be made that the town work with the leaseholder on the Lower Baptiste bogs to use them to capture the remaining piece of the plume that can be captured by more active treatment, thus sacrificing that area in order to preserve the private growers' bogs so that all these effects will ultimately work at Pond 14. He said that he did have an interest in the fish runs and that this process was started a while ago in order to eliminate the pesticides. He also remarked that maybe the group should start to write these things down and come to some sort of an agreement. He felt that there was a hybrid developing that had a lot of support.

Mr. Gordon suggested listing the alternatives and rating them. He asked for a show of hands in favor of Alternative A, EW-1 plus buyout. An attendee asked if this meant buying out the growers or just compensating them while they were at a loss. The attendee noted that this was a big difference. Ms. Balkus agreed that this was a big difference. She said that there would have to be negotiation with individual growers and the towns. Until that was negotiated, she did not feel that it could be defined. Ms. Breivogel commented that if people voted for Alternative A, this type of discussion would be required and people would be asking for negotiations to take place.

Mr. Gordon asked to see a show of hands for Alternative B, EW-1 plus channel realignment. He noted that the alternative included realigning the channel in the upper Baptiste bogs, lining the section in the upwelling area, separating the surface waters, and creating basins in E4. An attendee commented that there had he not heard a vote for Alternative A. Mr. Gordon stated that eight people had raised their hands for

Alternative A. The attendee commented that ideas had been heard from everyone present and that was quite a combination. Mr. Gordon explained that the public was making a statement as to what it would like to see the Bog Committee and Conservation Committee recommend to the Air Force.

Mr. Tripp commented that if it were up to him, he would recommend the process that was already started and was changing almost day by day; that was Alternative E. He suggested that the group include its recommendations to the Air Force regarding those things that it felt was important and should be preserved. He stated that the group wanted a separation of the natural stream from the day-to-day bog operation; it wanted a reduction in EDB down to non-detect so that the cranberries could continue to be sold; and it also wanted a return of anadramous fisheries. He noted that however these things were accomplished, those details would not be addressed until the implementation stage, and that level of detail would not be discussed tonight. Mr. Tripp commented that it seemed that the elements that the group would want to include in its recommendation had already been discussed and were actually outlined in the letter written by the selectmen six months ago.

Ms. Breivogel asked what was the cranberry growers' preferred alternative. Mr. Chaston replied that he thought that Alternative E was probably the best combination of all the alternatives.

Ms. Muramoto noted that Alternative E was a complex plan. She then asked what the significant differences were between Alternatives B and E. Mr. Szymoniak explained that Alternative B moved the river over and realigned the channel; this was not proposed in Alternative E. He said that the goal was to create a natural pond so that portions, or perhaps all, of the bog would provide enough area where clean water could mix. Alternatively, shallow well points could be installed to attempt to achieve the same concentration reduction. Mr. Szymoniak noted that there were three options to consider that did not involve moving the river.

Ms. Valiela commented that there was a lot of value to not moving the river, for the fish, for the existing cultural values, and in terms of permitting considerations. She noted that the clear explanation that Alternative B moved the river indicated to her that it was not in the best interest of the town. She recommended that the cleanup be accomplished and the EDB problems be solved with Alternative E.

Ms. MacRae stated that Alternative E would also move the river. Mr. Szymoniak explained that Alternative B would line a piece of that channel to keep the EDB from upwelling. Basically, a berm would be created, however the channel itself would remain the primary channel for that bog. He said that there were a couple of options for the East Thompson bog; one side could be bermed without moving the river; and some area could be converted back to wetlands. He reiterated that there were options that could be considered with Alternative E without moving the river.

Ms. MacRae asked if there would be public input on this. Mr. Gordon stated that there would be an opportunity for public input when the Notice of Intent was filed.

Mr. O'Hara remarked that the compensation to the cranberry growers for lost crops should be a precedent for potential future situations when there may be a "cranberry scare." He emphasized that the compensation aspect should stay in place until non-detect was achieved and there was a clean cranberry crop.

Mr. Chaston stated that no matter what happened, the Air Force would not be getting out of the cranberry business in the year 2000. He felt that the town and the growers should lobby their senators to ensure that the Air Force would provide long-term compensation. He noted that the growers needed to have full protection. He also noted that their lives had been put on hold as they sat day to day wondering if they would have a paycheck. Mr. Chaston stressed that this had to be ironed out; long-term compensation was needed. He also noted that it would be 5 to 7 years before the bogs went back into production.

Mr. Tripp stated that he was making a suggestion in the hope that a recommendation would be built from

it. He referred to the physical separation of the bog operation from the stream, the entire length, and noted that one of the issues of concern was the public's perception, perhaps unsubstantiated, that there were pesticides and nutrients leaking from the bogs into the natural system. Therefore, he felt that one of the plan elements should be to the ability to retain water after the application of chemicals for some period of time before the water would be released into the natural system; the entire length would then have to be bermed.

Ms. Selman noted that she was in favor of long-term compensation. She recommended closing down the affected areas, providing appropriate compensation to the growers, letting the bogs become clean naturally, and paying the growers during that 5-year period. She noted that the crop would be maintained in cycles, but the berries would not be sold. Mr. Chaston stated that this was basically what was now happening; the bogs were on hold and they were being maintained at a very minimal level to keep the berries and vines from dying. Ms. Selman stressed that she was suggesting that the growers be paid properly.

Ms. Muramoto noted her sense that the group was heading toward Alternative E. However, she noted that she was still hearing some preference for compensation and for complete separation of the river from the bogs, which was not included in Alternative E at the moment. She concluded that the preference seemed to be for Alternative E plus complete separation of the bogs from the river, in addition to consideration of continued compensation for some time.

Ms. Bryden asked if the plume had been detected in an area downstream of the lower Baptiste bog. Mr. Szymoniak replied yes, a narrow part of the plume had escaped and was deep in the area of MW1300, the leading edge, at a depth of 100 feet. Ms. Bryden asked how Alternative E would address that situation. Mr. Szymoniak explained that Alternative E did not have to deal with this, based on the small contaminant concentrations and considering the large volumes of water in that area. He said that the six monitoring wells in that area were all non-detect. Also, based on sampling, there were decreased levels of EDB going down river. He noted that there was a tremendous amount of water in the river, and only a small fraction of it was contaminated.

Ms. Holden asked how certain Mr. Szymoniak was that EDB would not show up at some other point. Mr. Szymoniak stated that drilling had been done all the way back up to the base and up to FS-13, and the plume could not be detected. He said that very low concentrations were found in the area of the Crane Wildlife Preserve, and that those were being investigated as part of a remedial investigation in that area. Mr. Szymoniak also reported that once above the Lockstead Association, the concentrations of EDB fell off dramatically.

Mr. Corriveau recommended a combination of Alternatives A and E, and separating the river from the bogs. He further recommended trying to delete the controversy about the wetlands and berms in the East Thompson bog, alleviating the concerns of the people who live in that area, and enhancing the river. He said that the Air Force should implement Alternative E, but leave some options open such as segregating the river. He said that the Air Force should do all the right things and get rid of the bad things. He also commented that price did not really weigh in because a dollar value could not be put on what there was in this community.

Mr. Gordon remarked that his understanding was to go with Alternative E, realigning the river, and possibly incorporating some of Alternative B. Ms. Muramoto added that it would actually be Alternative E with berming, continued compensation, water supply for growers, and continued monitoring.

Mr. Gordon asked if there was a motion. Ms. Selman mentioned her concern that the public has not always been informed of these meetings; she said that the general public, not just the cranberry growers, should be informed of all meetings.

Mr. Tripp made the following recommendation: that the Conservation Commission, along with the Board of Selectmen, write to the Air Force to recommend the process incorporated in Alternative E (recognizing

that the details seen on the particular chart today would evolve and accepting that evolution), but that the process include the reduction of EDB, all the way downstream, to non-detect and that it include a physical separation of the bogs from the natural stream and recovery, to the extent possible, of the natural stream. Also, continued compensation for losses should be included due to this chemical damage. Mr. Tripp also stated that the Conservation Commission would make every effort to hold these public meetings, not only at the minimal legal public notice standard, but at a more aggressive public notice standard.

Mr. Szymoniak asked if Mr. Tripp favored a phased approach, progressing toward a solution by trying to break it down in phases rather than trying to commit to one complete scope that would cover all of it. Mr. Tripp replied that he had been frustrated during the past series of hearings that things came in such a piecemeal way that one did not have any sense of the whole project. He felt that the community now had a much better sense of what the whole project might be, rather than when it was viewed in a piecemeal fashion.

Ms. Muramoto suggested that the Notice of Intent present as much of everything as possible. She said that it should include all of the ideas in a package, which would be easier to modify later, rather than trying to add significant portions at a later date.

Mr. McLaughlin seconded the motion of the Bog Commission's recommendation as stated by Mr. Tripp. Mr. Gordon stated that there was consensus in favor of the recommendation, and the motion was carried.

The meeting adjourned at 9:25 PM.

MMR MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

FS-28
Coonamessett River
EDB Response Plan

Falmouth Conservation Commission

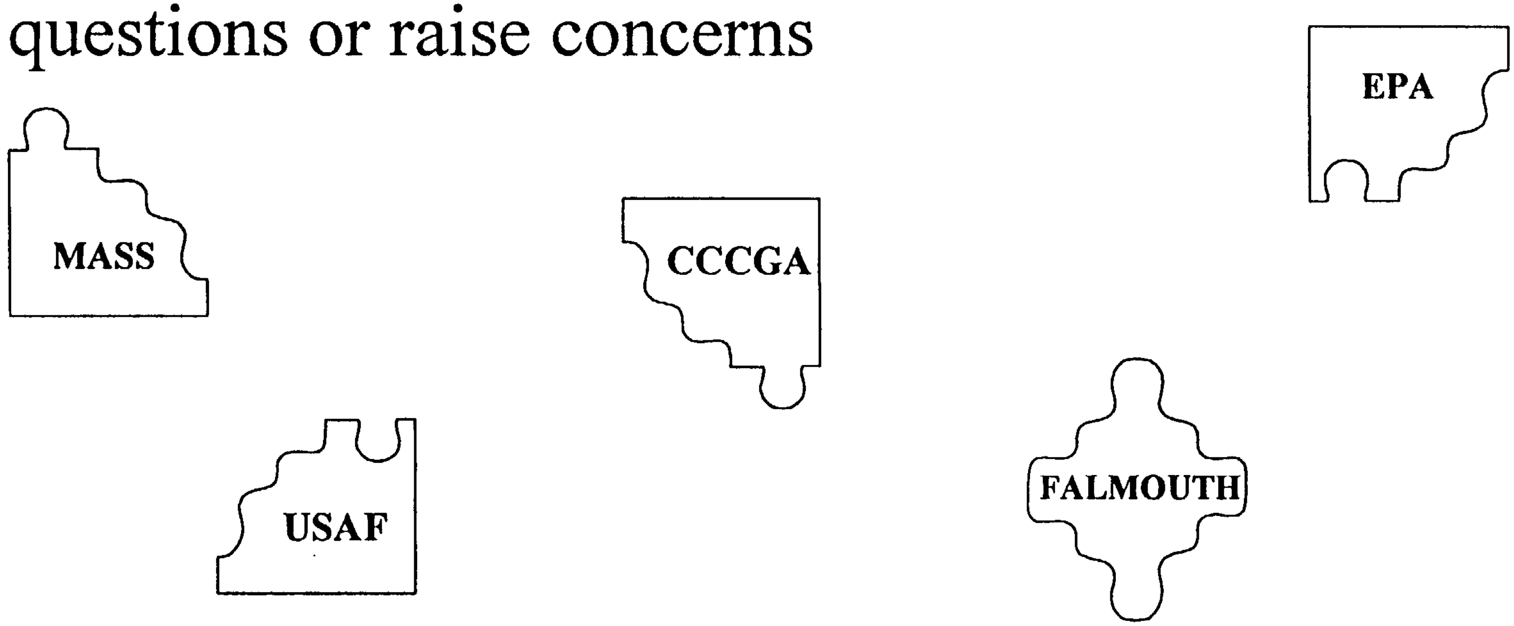
Bog Subcommittee

16 September 1998

Presented by: Nancy Balkus/Tom Szymoniak

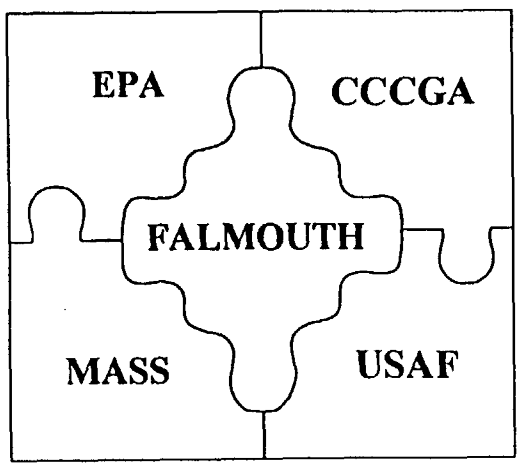
Purpose of Tonight's Presentation

- Present potential alternatives being considered for the Coonamessett River EDB Response Plan
- Provide an opportunity for stakeholders to ask questions or raise concerns



Goals of Tonight's Presentation

- To evaluate which alternative best resolves the EDB problem and meets the community's needs
- To move toward a consensus agreement on a preferred alternative at the 21 Sep 98 meeting



MMR
MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

Stakeholder Issues

FALMOUTH
- Schedule must consider cranberry and fishery seasons
- On-Going Maintenance of Bogs
- Long-term Benefit of Separating Bogs
- Ecological Impacts - flow, turbidity, erosion, turbulence, dissolved oxygen
- Ponding, Water Retention Impacts
- Vernal Pool and Natural Wetland Impacts
- Flood Storage
- Effects on Abutters
- Air Quality
- Pesticides
- Clean Water Supply for Bogs
- Future Use as Bogs/Wetlands

CRANBERRY GROWERS
- Work with Towns and Growers
- Want Win-Win for Everyone
- On-Going Maintenance of Bogs
- Communication - Want Updates
- Clean Water Supply for Bogs

COMMONWEALTH
- On-Going Maintenance of Bogs
- Vernal Pools and Natural Wetlands
- Herring Runs and Brook Trout Habitat
- Treated Water Discharge
- Ponding Impacts
- Construction Impacts
- Want Active Treatment
- Air Quality
- Flood Storage
- Impacts or Rare Species
- Hydrological Balance
- Mitigation
- Long-term Outcome
- Timing of Construction Season - Herring Run - Spring, Trout Spawn in Fall
- Fish Health
- Loss of Cranberry Acreage
- Permitting Requirements
- Legal Authority

EPA
- Alternatives Analysis
- Plume Characterization
- Impacts on Aquatic Habitat
- Meet Water Quality Standards
- Long-term Effects
- Contingency Plan
- Permits
- Legal Authority

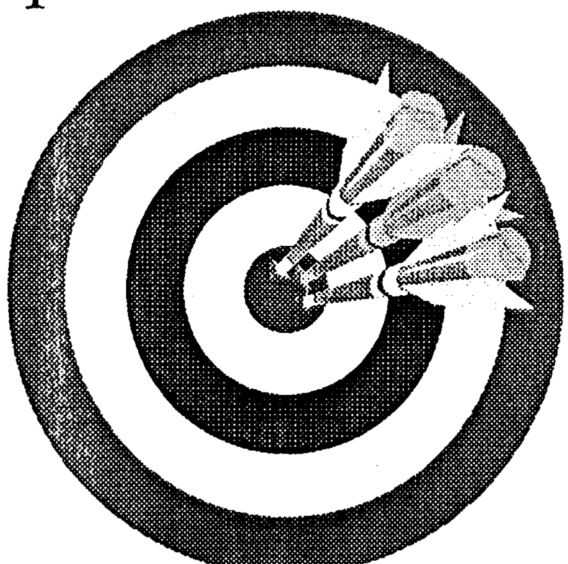
MMR
- Implement an action to return the bogs to production by 2000
- Be protective of human health and the environment
- Cost effective/timely response
- Win-Win for Everyone

MMR MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

Past and Present EDB Responses

- EW-1 Interim Action - Ongoing
- SWOU Remedial Investigation - Ongoing
- Bog/River Separation Plan - Planning

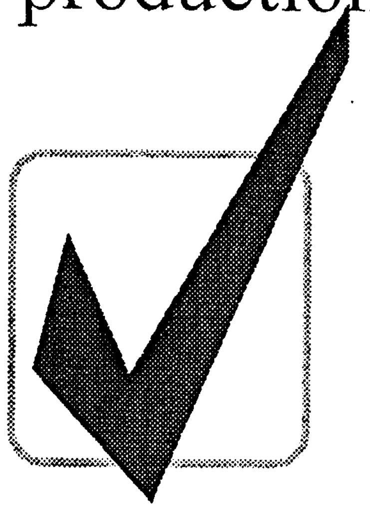


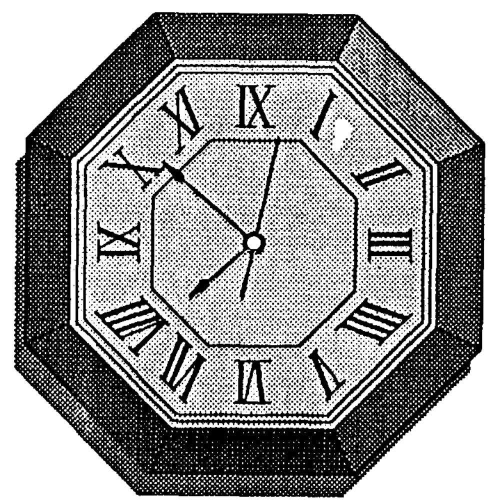
MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

Goals of Bog/River Separation Plan

- Protect Human Health and the Environment
- Implement an action to return the bogs to production by the year 2000

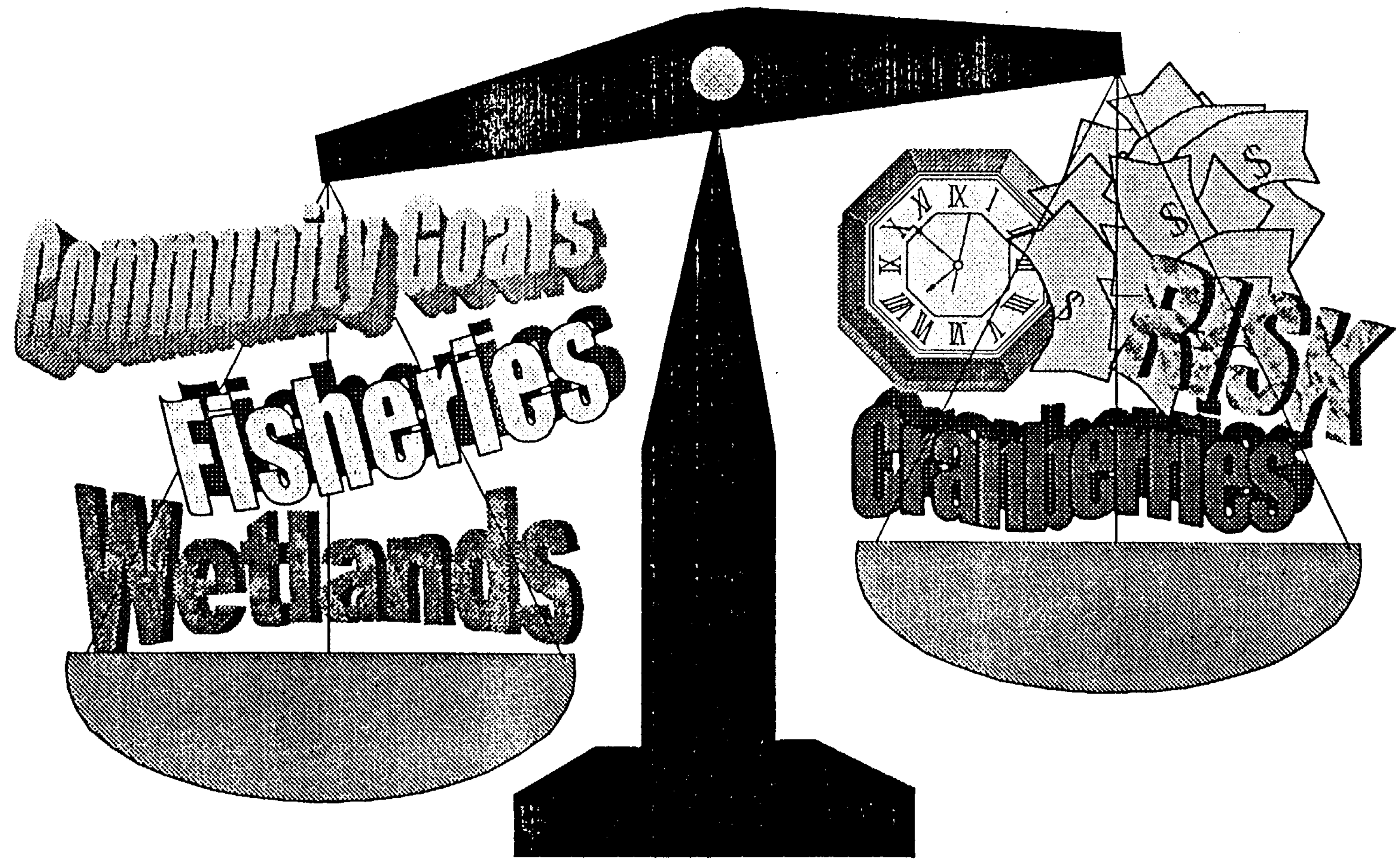


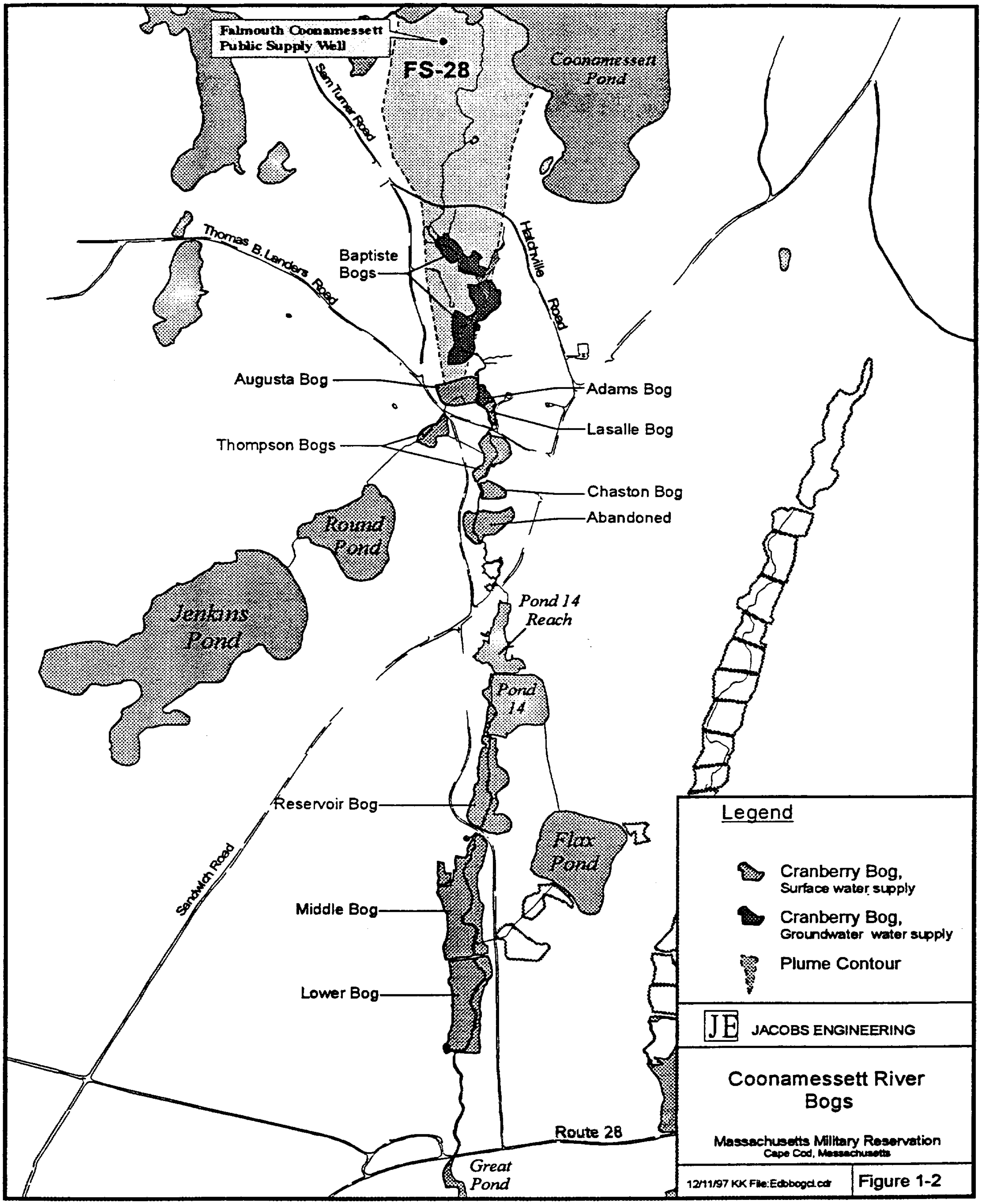


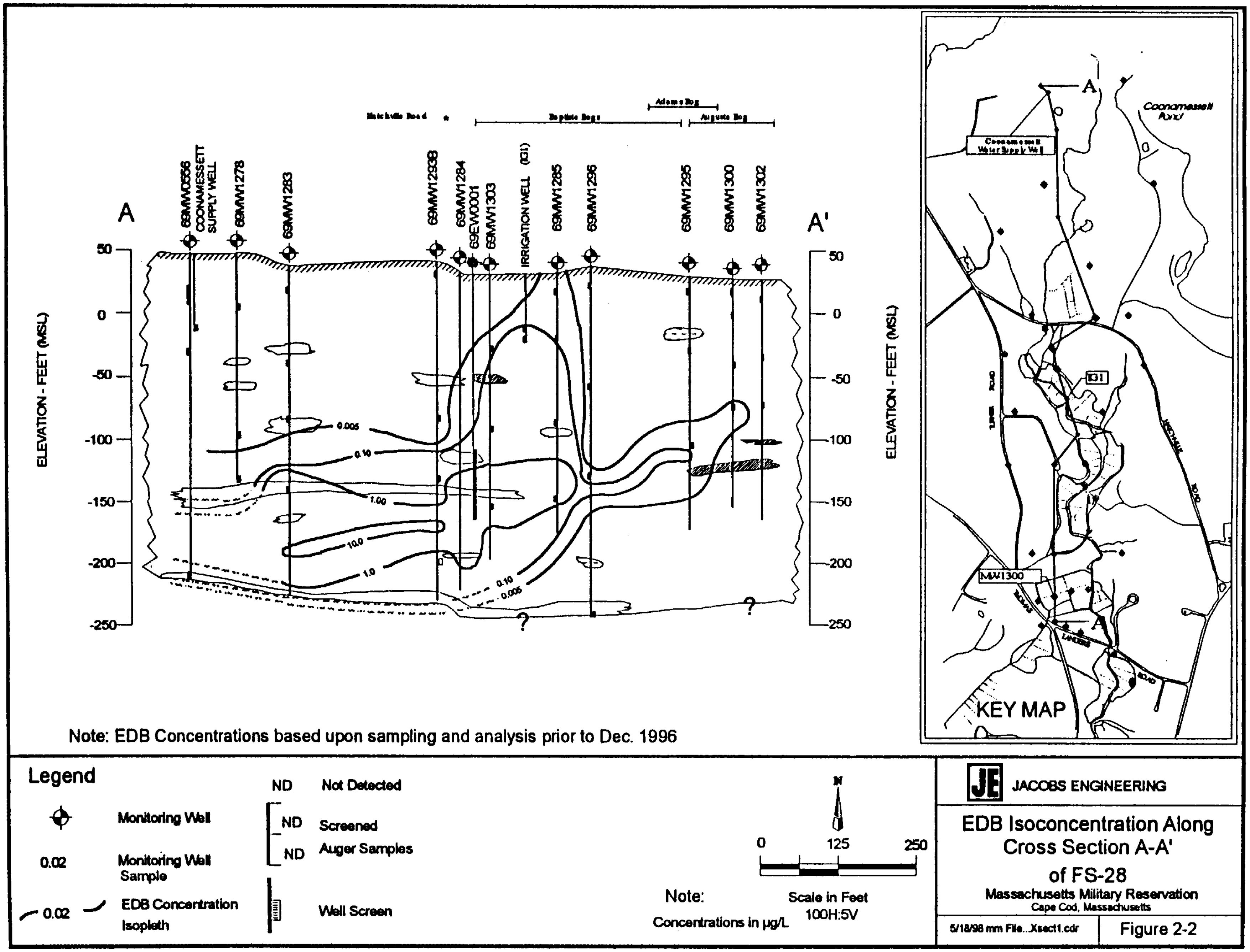
MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

Balance Competing Interests




Falmouth Coonamessett Public Supply Well
FS-28
Coonamessett Pond
Sam Turner Road
Thomas B. Landers Road
Hatchville Road
Baptiste Bogs
Augusta Bog
Adams Bog
Lasalle Bog
Thompson Bogs
Chaston Bog
Abandoned
Round Pond
Jenkins Pond
Pond 14 Reach
Pond 14
Reservoir Bog
Sandwich Road
Flax Pond
Middle Bog
Lower Bog
Route 28
Great Pond
Legend
Cranberry Bog, Surface water supply
Cranberry Bog, Groundwater water supply
Plume Contour
JE JACOBS ENGINEERING
Coonamessett River Bogs
Massachusetts Military Reservation
Cape Cod, Massachusetts
12/11/97 KK File:Edbbogcl.cdr
Figure 1-2


A
A'
69MW0556
COONAMESSETT SUPPLY WELL
69MW1278
69MW1283
69MW1293B
69MW1284
69EW0001
69MW1303
IRRIGATION WELL (IG1)
69MW1285
69MW1296
69MW1295
69MW1300
69MW1302
ELEVATION - FEET (MSL)
50
0
-50
-100
-150
-200
-250
0.005
0.10
1.00
10.0
1.0
?
Coonamessett Pond
IG1
MW1300
KEY MAP
Note: EDB Concentrations based upon sampling and analysis prior to Dec. 1996
Legend
Monitoring Well
0.02 Monitoring Well Sample
0.02 EDB Concentration Isopleth
ND Not Detected
ND Screened
ND Auger Samples
Well Screen
Note:
Concentrations in µg/L
N
0 125 250
Scale in Feet
100H:5V
JE JACOBS ENGINEERING
EDB Isoconcentration Along Cross Section A-A' of FS-28
Massachusetts Military Reservation
Cape Cod, Massachusetts
5/18/98 mm File...Xsect1.cdr
Figure 2-2

FS-28 Time Critical Removal Action

- Extraction Well 1 (EW-1) continues to pump 600 gpm
- Capturing majority of plume
- Groundwater Model shows 5-7 years to complete contaminant upwelling
- Model estimates marginal risk for next 5-7 years
- EW-1 estimated to remain in operation for 10 years
- Some uncertainty associated with uncaptured portion of plume, no need for additional interim action.

MASSACHUSETTS MILITARY RESERVATION

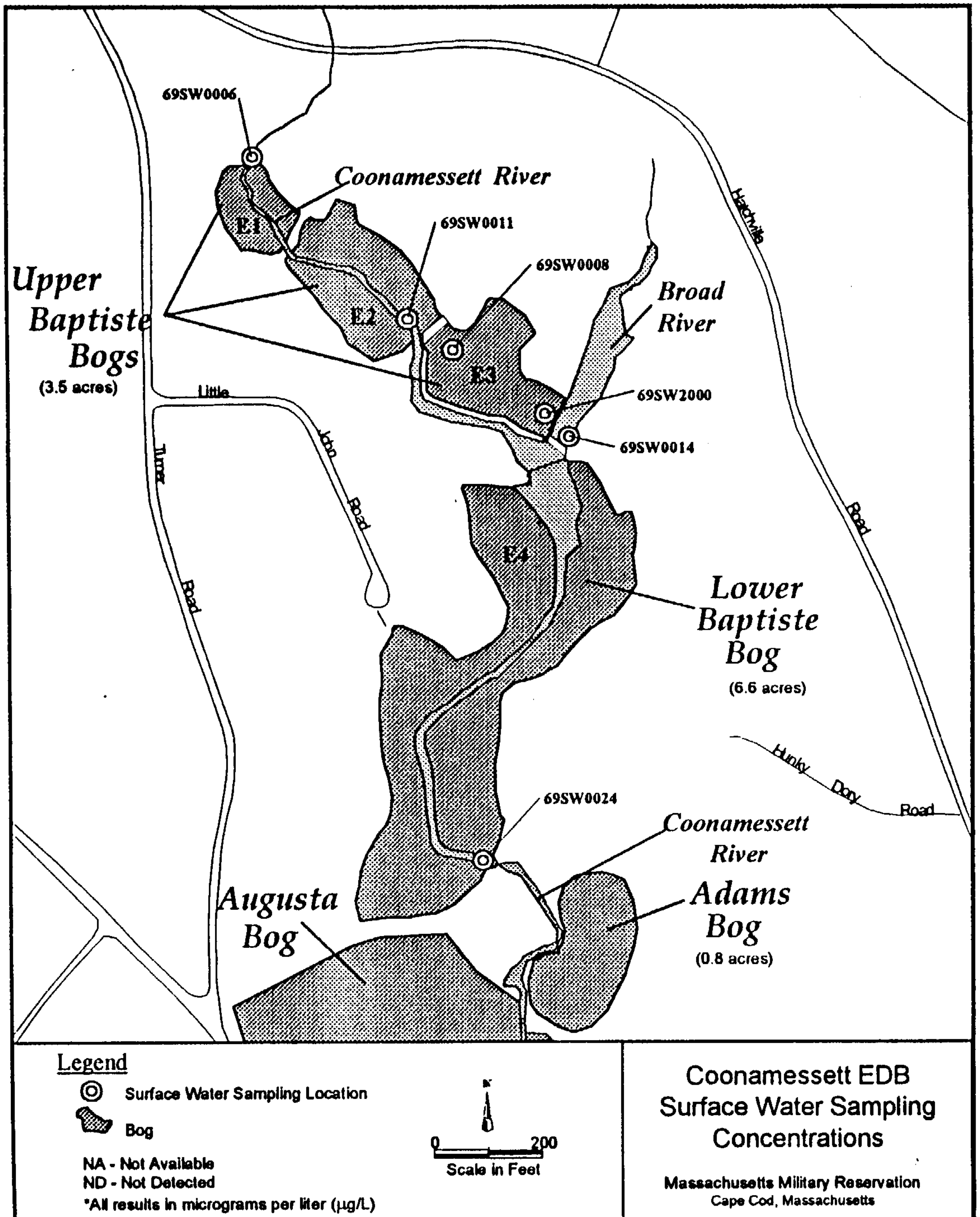
Installation Restoration Program

EW-1 Performance

- 8" diameter extraction well
- Two 20,000 lb Granular Activated Carbon vessels
- Average Influent range ~ 0.5 to 1.3 µg/L
- Effluent = Non-Detect

69SW0006	
08/97	ND
09/97	ND
10/97	ND
11/97	ND
12/97	ND
01/98	ND
02/98	ND
03/98	ND
04/98	ND
05/98	ND
07/08/98	ND
07/28/98	ND
08/13/98	ND

69SW0011	
03/98	ND
04/98	ND
05/98	ND
07/08/98	ND
07/28/98	ND



69SW0008	
09/98	0.011

69SW0014	
07/97	0.210
08/97	0.140
09/97	0.120
10/97	0.026
11/97	0.080
12/97	0.017
01/98	0.018
02/98	0.020
03/98	0.024
04/98	0.066
05/98	0.110
06/98	0.043
07/08/98	0.021
07/28/98	0.021
08/11/98	0.069

69SW2000	
04/98	0.035
05/98	0.091
07/08/98	0.050
07/28/98	0.033

69SW0024	
07/97	0.068
08/97	0.120
09/97	0.077
10/97	ND
11/97	0.062
12/97	0.063
01/98	ND
02/98	ND
03/98	0.059
04/98	0.030
05/98	0.078
07/08/98	0.043
07/28/98	0.043
08/13/98	0.036

Note: MDEP MCL for Drinking Water = 0.02 µg/L; 10^{-5} Risi ed surface water concentration for integrated receptor ~ 0.110 µg/L

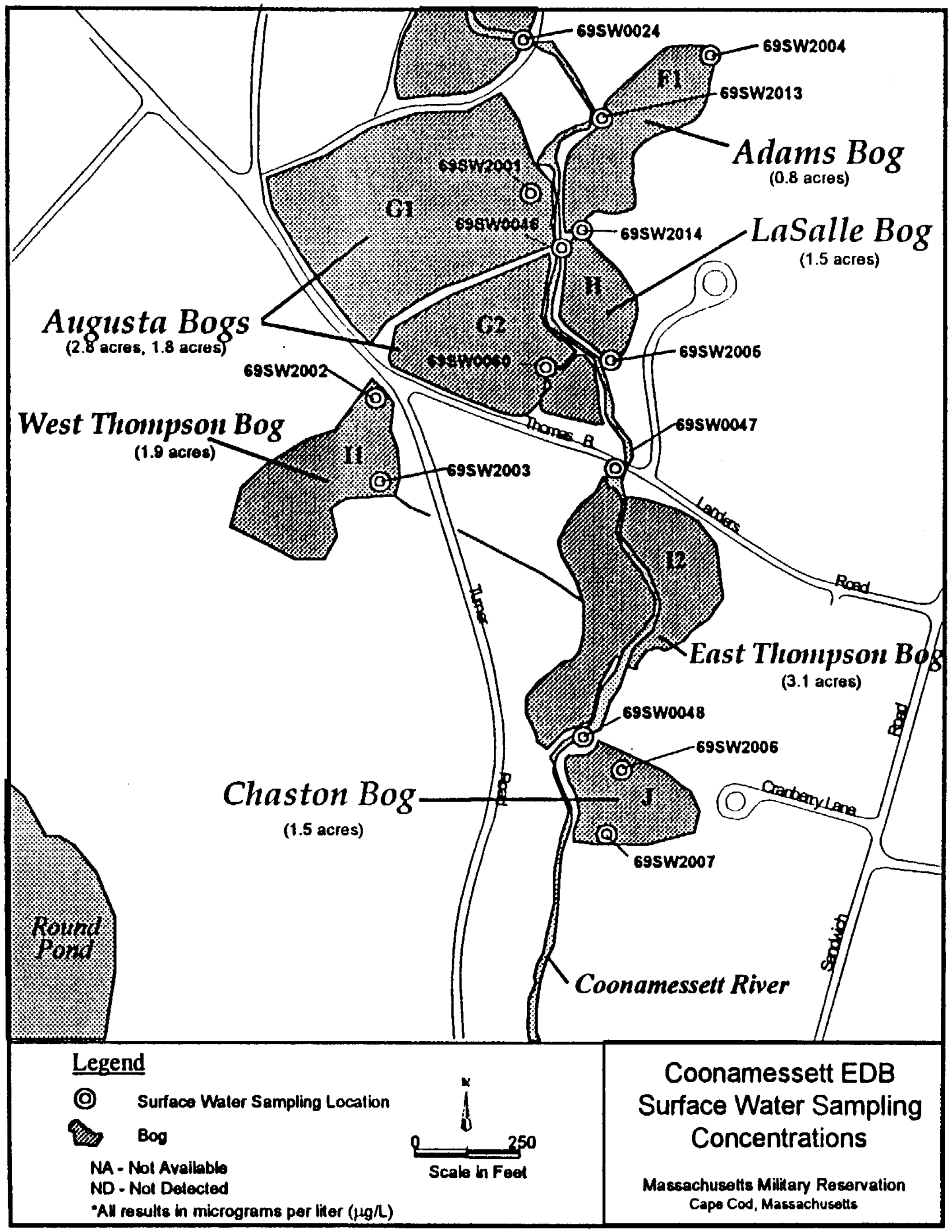
69SW0046	
07/97	0.064
08/97	0.100
09/97	0.074
10/97	ND
11/97	0.053
12/97	0.022
01/98	ND
02/98	ND
03/98	0.040
04/98	0.026
05/98	ND
06/98	0.035
07/98	0.033
08/98	0.048

69SW2003	
04/98	ND
05/98	ND
06/98	ND
07/98	ND
08/98	ND

69SW2001	
04/98	ND
05/98	ND
06/98	ND
07/98	ND

69SW0060	
07/97	ND
08/97	ND
09/97	ND
10/97	ND
04/98	ND
05/98	ND
06/98	ND
07/98	ND

69SW2002	
04/98	NA
05/98	NA
06/98	ND
07/98	ND
08/98	ND



69SW0024	
06/20/97	0.077
07/17/98	0.100
08/25/97	0.120
09/09/97	0.089
10/07/97	0.098
10/27/97	ND
11/13/97	0.055
12/10/97	0.063
01/29/98	ND
02/19/98	ND
03/16/98	0.045
04/14/98	0.030
05/26/98	0.078
07/08/98	0.043
07/28/98	0.043
08/13/98	0.036

69SW2005	
04/98	0.036
05/98	0.040
06/98	0.008
07/98	0.011

69SW0047	
07/97	0.053
08/97	0.060
09/97	0.064
10/97	ND
11/97	0.040
12/97	0.014
01/97	ND
02/97	ND
03/97	0.034
04/98	0.016
05/98	0.040
06/98	0.030
07/98	0.029

69SW2006	
07/18/97	ND
08/11/97	ND
09/09/97	ND
10/07/97	ND
11/11/97	ND
12/10/97	ND
01/29/98	ND
02/19/98	ND
03/16/98	ND
04/14/98	ND
05/26/98	ND
07/08/98	0.024
07/29/98	ND
09/01/98	ND

69SW2004	
04/98	ND
05/98	ND
06/98	ND
07/98	ND

69SW2013	
04/98	0.044
05/98	0.044
06/98	0.031
07/98	0.030

69SW2014	
07/17/97	0.250
08/13/97	0.196
09/16/97	0.120
10/07/97	0.049
11/11/97	0.080
12/10/97	0.017
01/29/98	0.018
02/19/98	0.020
03/16/98	0.024
04/01/98	ND
05/26/98	0.110
07/08/98	0.010
07/29/98	0.034

69SW0048	
04/98	0.033
05/98	0.037
06/98	ND
07/98	0.028
09/01/98	0.035

69SW2007	
04/98	ND
05/98	ND
06/98	ND
07/98	ND
09/01/98	ND

Note: MDEP MCL for Drinking Water = 0.02 µg/L; 10^{-5} Risk-based surface water concentration for integrated receptor ~ 0.110 µg/L

69SW2008

04/98	0.011
05/98	0.015
06/98	ND
07/98	0.00
08/98	0.011

69SW0051

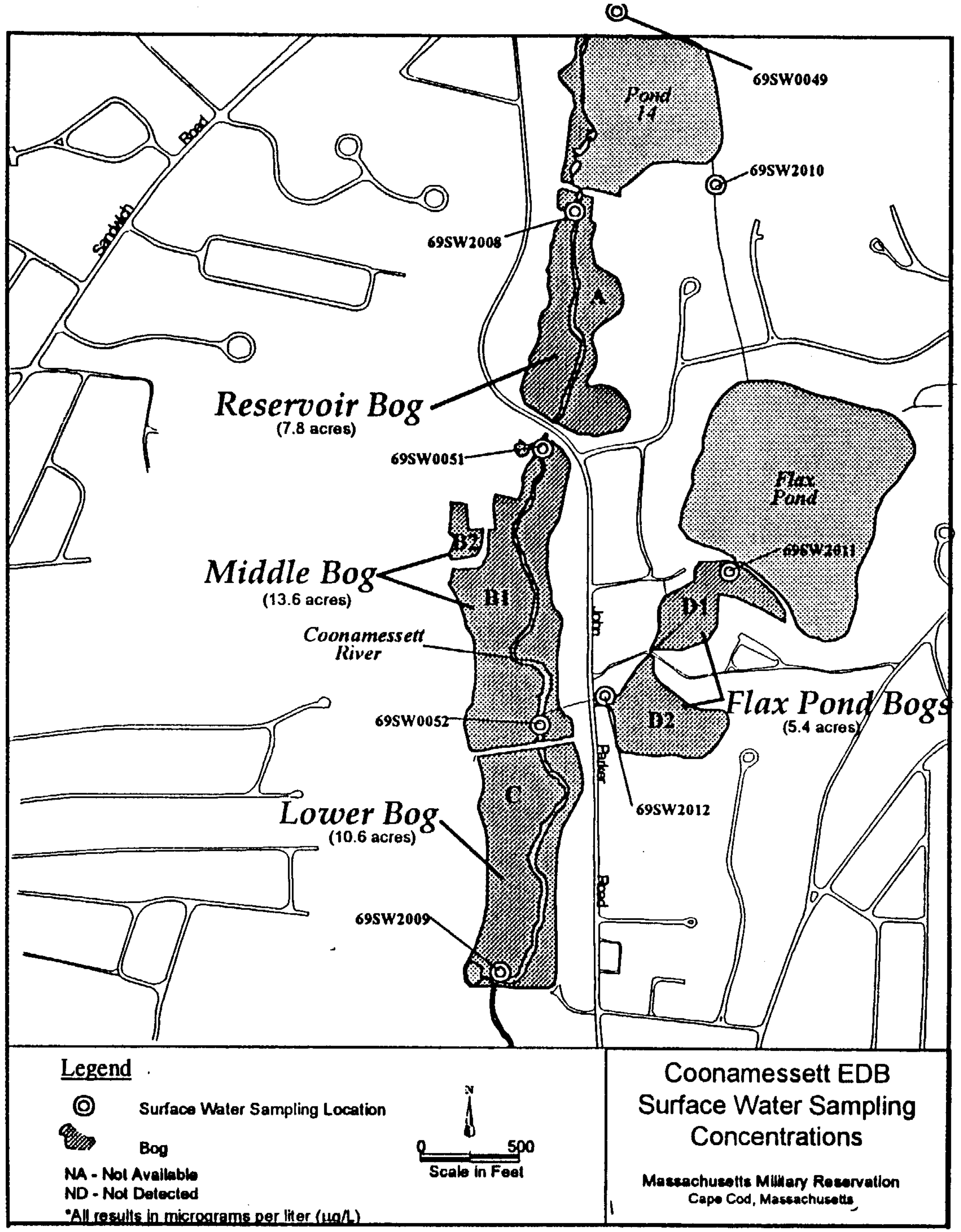
08/97	0.007
09/97	0.019
10/97	ND
11/97	ND
12/97	0.012
01/98	ND
02/98	ND
03/98	ND
04/98	ND
05/98	0.012
06/98	ND
07/98	0.006
08/98	0.009

69SW0052

11/96	ND
12/96	ND
01/97	ND
02/97	ND
03/97	0.009
04/97	ND
04/98	ND
05/98	ND
06/98	ND
07/98	ND
08/98	ND

69SW2009

04/98	ND
05/98	ND
06/98	ND
07/98	ND
08/98	0.006J



69SW0049

07/14/97	0.038
08/12/97	0.040
09/10/97	0.048
10/17/97	ND
11/13/97	0.016
12/10/97	0.026
01/29/98	ND
02/19/98	ND
03/16/98	0.019
04/14/98	0.014
05/26/98	NA
07/08/98	NA
07/29/98	0.023

69SW2010

04/98	0.0130
05/98	0.0110
06/98	ND
07/98	NA

69SW2011

04/98	ND
05/98	ND
06/98	ND
07/98	ND
08/98	ND

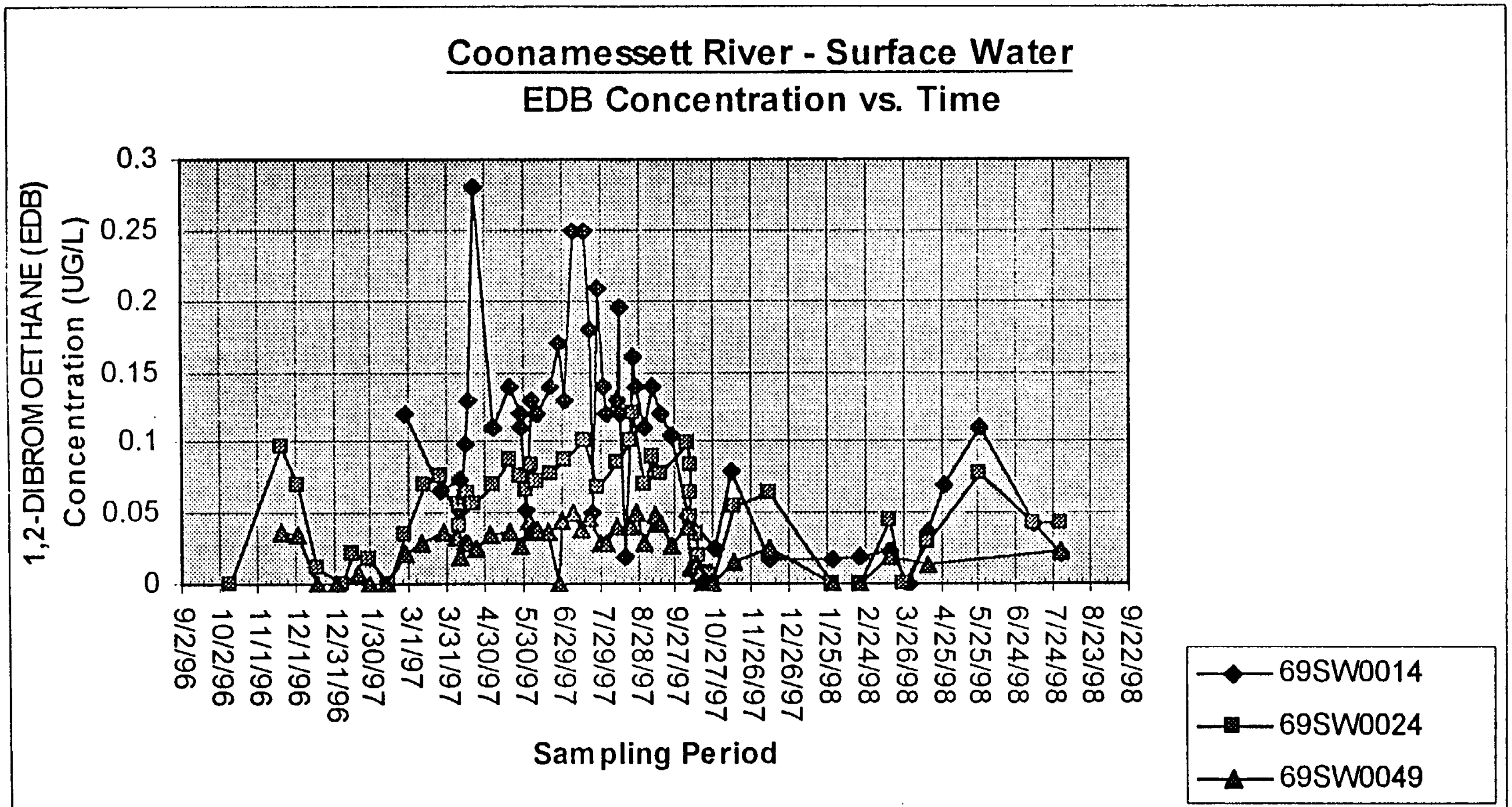
69SW2012

04/98	ND
05/98	ND
06/98	ND
07/98	ND
08/98	ND

Note: MDEP MCL for Drinking Water = 0.02 µg/L; 10^{-5} Risk d surface water concentration for integrated receptor ~ 0.110 µg/L

MASSACHUSETTS MILITARY RESERVATION

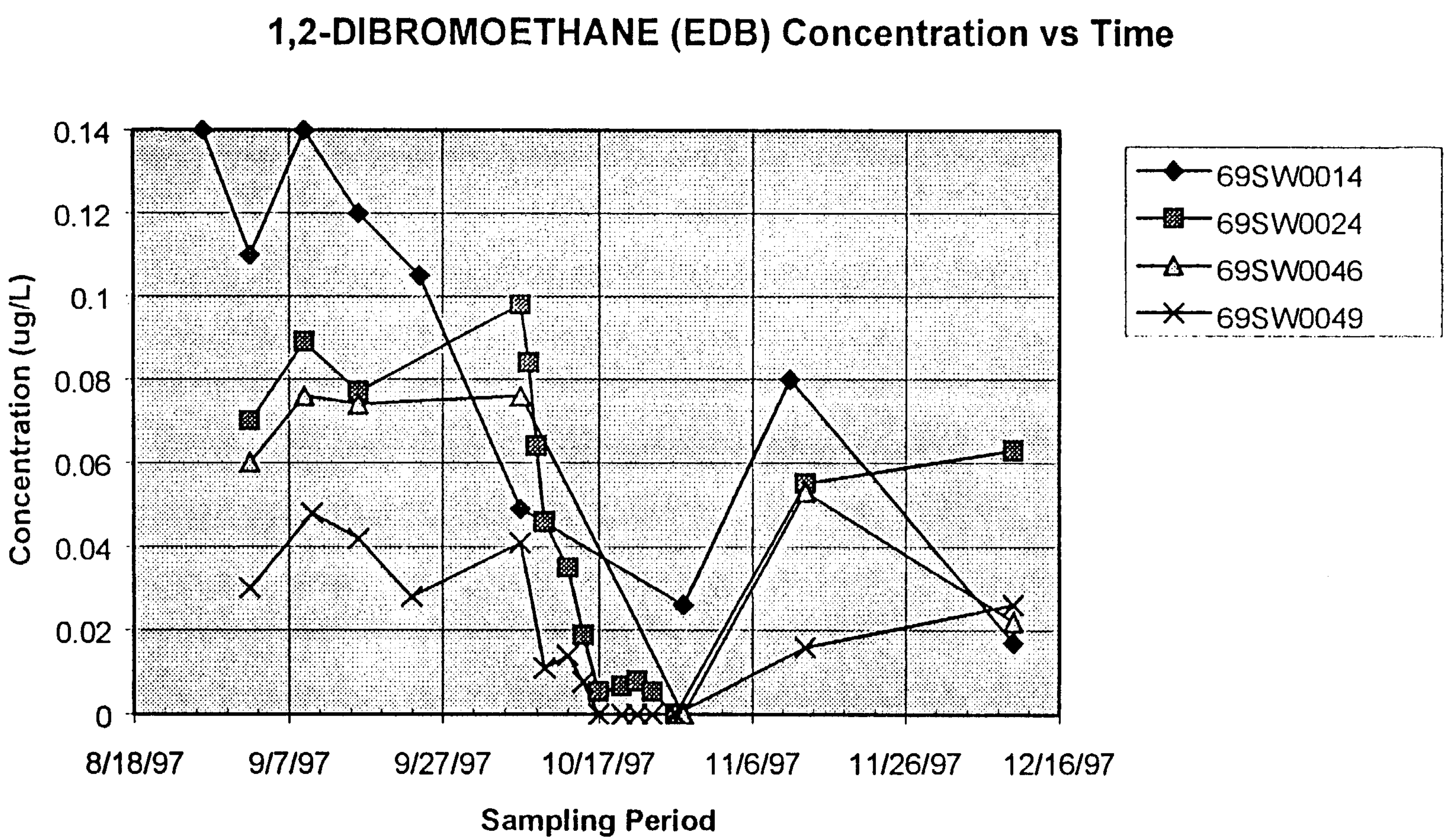
Installation Restoration Program



MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

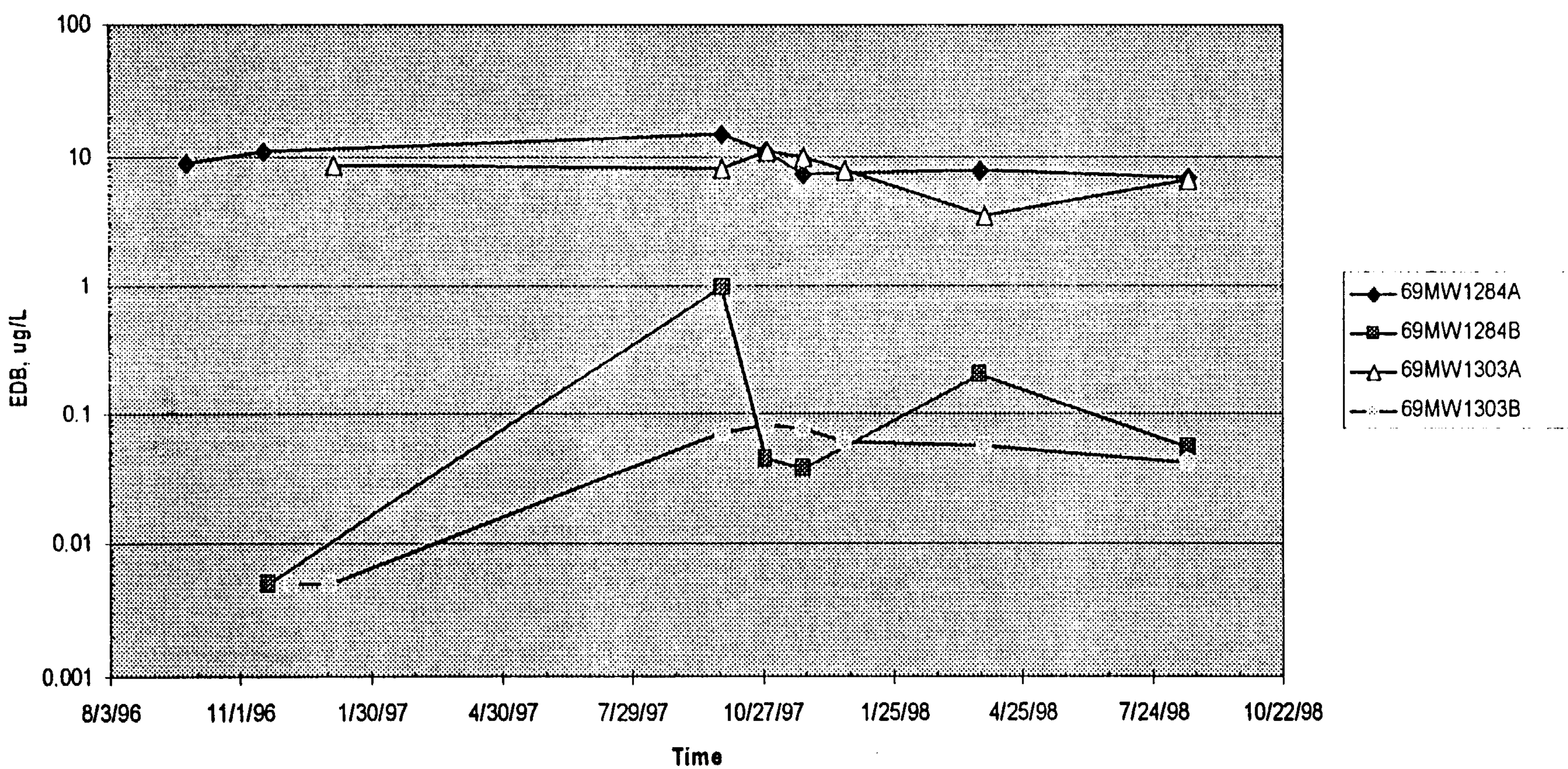
Influence of Flooding on the EDB Concentrations



MMR
MASSACHUSETTS
MILITARY RESERVATION

Installation Restoration Program

Coonamessett River - Groundwater
EDB Concentrations at 69MW1284 & 69MW1303



Bog Alternatives Overview

- Upper Bogs (~26 acres)
  - Buy Out (A)
  - Separate Bogs/Alternate Water Source (B,D,E)
  - Treatment (Active or Passive) (C,E)
- Lower Bogs (~38 acres)
  - Dependent on action in upper bog
  - Separate bogs (D)

MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

Bog Alternatives - Coonamessett River

- No Action
- Alternative A - EW-1 + Buy Out
  - acquire land, crop or long term lease
    - NOTE: Currently no legislative authority beyond CY99
- Alternative B - EW-1 + Channel Realignment
  - isolate upwelling and improve fish pathway
- Alternative C - EW-1 + Channel Realignment w/ Treatment
  - active treatment using shallow well points
- Alternative D - EW-1 + Separate All Bogs
  - separate entire river system
- Alternative E - Phased Approach
  - return small sections of bogs at a time via berms, alternate water source

Alternative A - EW-1 + Buy Out

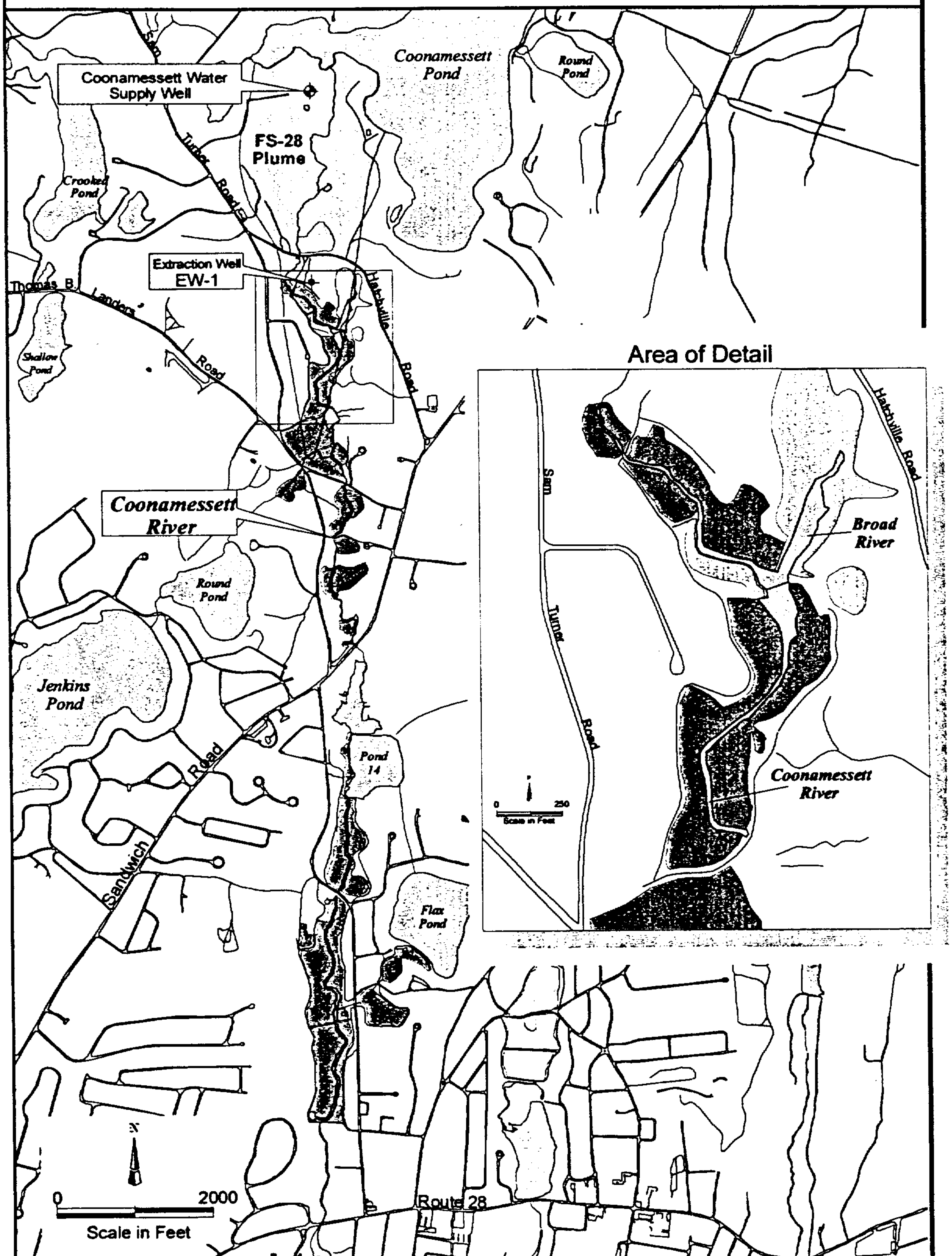
(Note: Currently No legislative authority beyond CY99)

- **Acquire land, crop, or long term lease**
- **Continue to operate EW-1**
- **Maintain bogs in useable condition**
- **Install controls to limit access if necessary**
- **Continue sampling and monitoring**

- Advantages
  - no disruption to current use
  - maintains bogs and channel
  - limits food chain exposure
- Disadvantages
  - several years until bogs brought back to production
  - no improvement to bogs
  - must seek additional legislative authority for compensation

Alternative A

Buy Out



Legend

Bog | Pond | Wetland

Coonamessett River
Bog Alternative A
Massachusetts Military Reservation
Cape Cod, Massachusetts

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MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program
Coonamessett

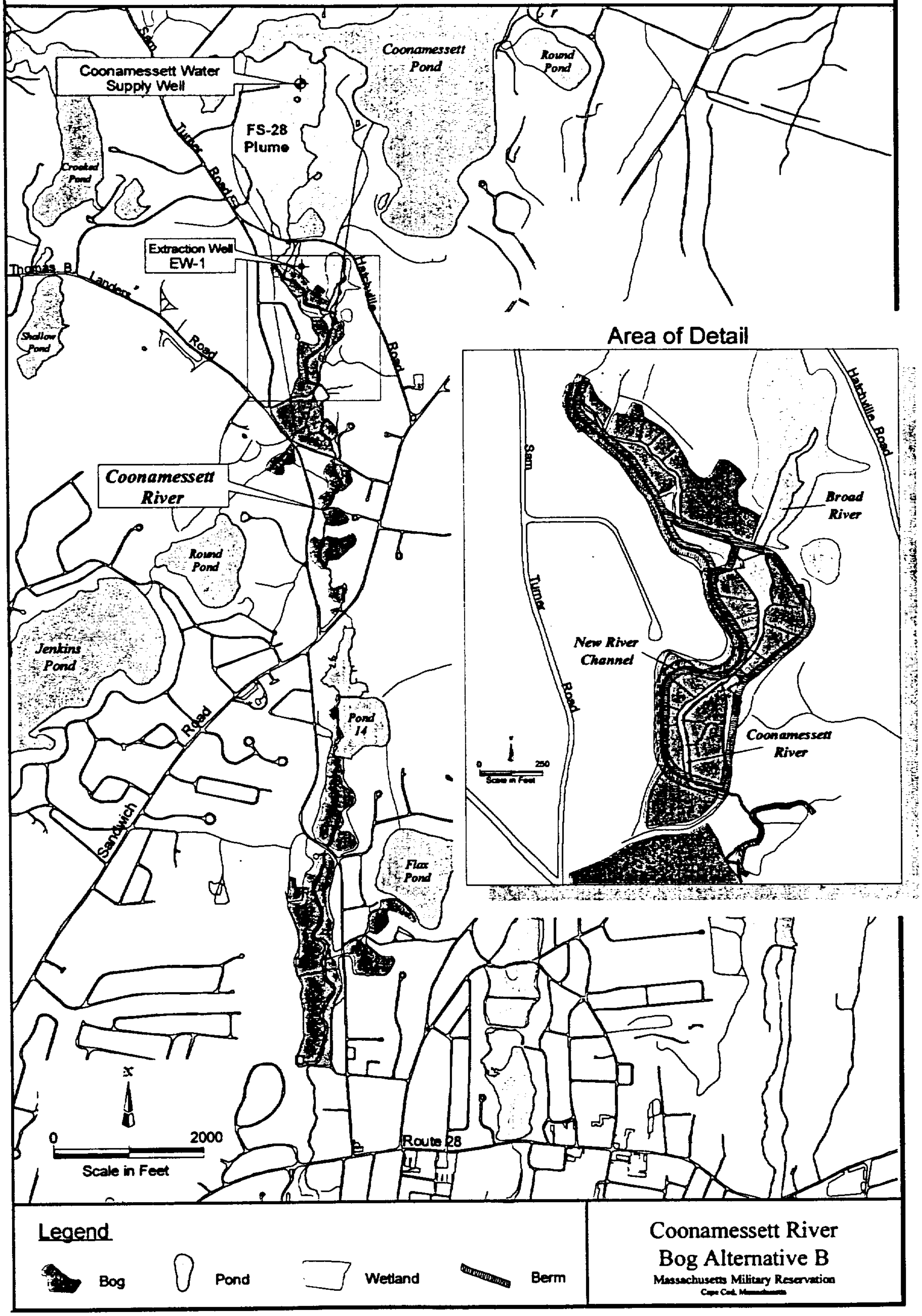
Alternative B - EW-1 + Channel Realignment

- **Continue to operate EW-1**
- **Realign channel in upper bogs (Baptiste)**
- **Line section in upwelling area**
- **Separate surface waters**
- **Create basins**
- **Mitigate wetland losses**
- **First phase of any alternative**
- **Monitor performance**

- Advantages
  - separates flows to control upwelling
  - improves fish pathway
  - creates riparian zone
- Disadvantages
  - disrupts current channel
  - EDB in upper river system
  - relies on understanding of water movement

Alternative B

Channel Realignment
Berm Upper Bogs



MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

Coonamessett

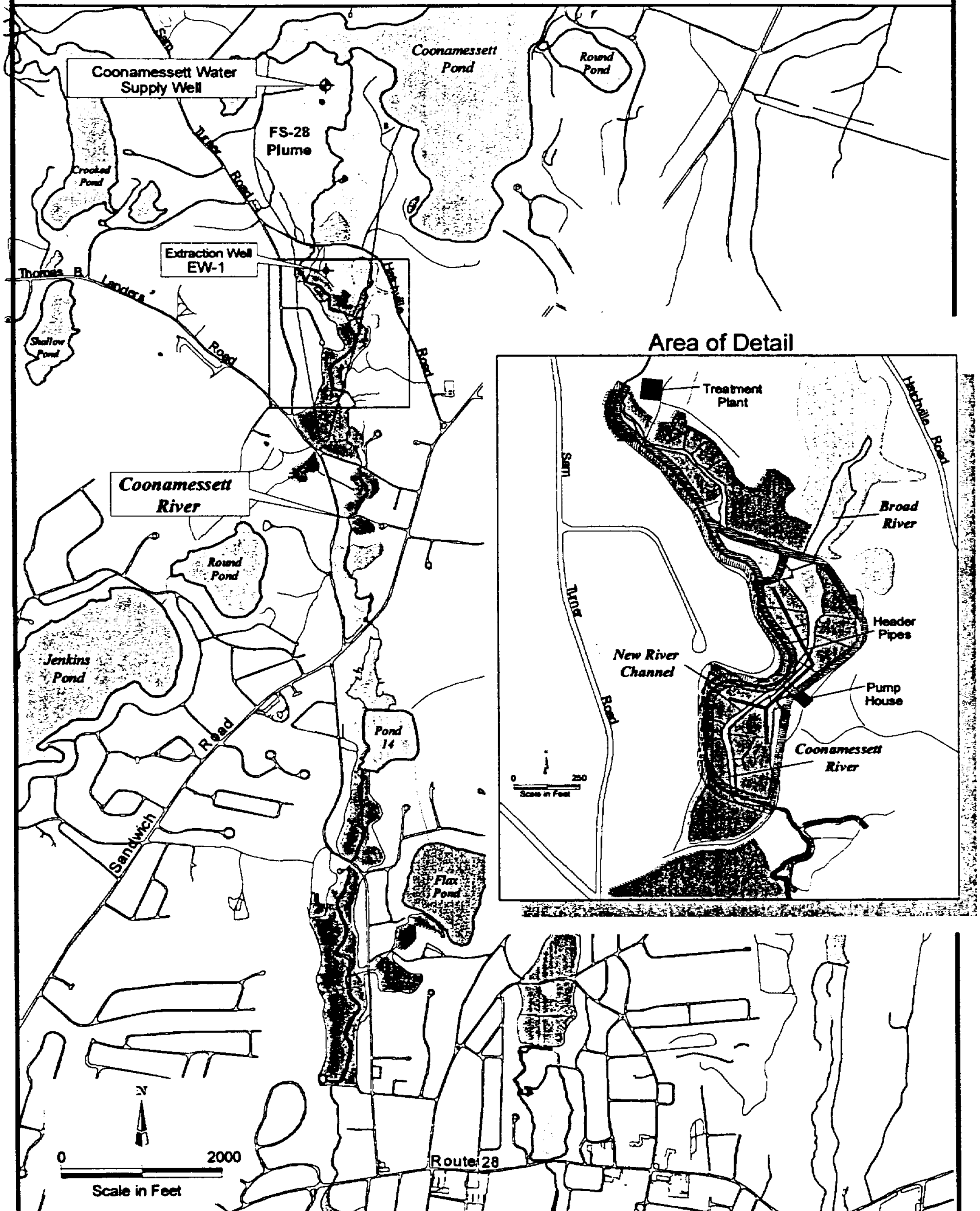
Alternative C_1 - EW-1 + Realign w/Treatment
C_2 - EW-1 + Treatment

- **Continue to operate EW-1**
- **Use shallow well points and sumps**
- **Well point spacing 6 -10' at a depth of 15'**
- **GAC treatment only**
- **Expand current plant location**
- **Second phase of alternatives**
- **Discharge in river at four locations**

- Advantages
  - gets entire river to non-detect
  - flexible
  - protects public
- Disadvantages
  - large treatment volume
  - iron bacteria and fouling
  - operation and maintenance
- Pilot Dewatering Test Needed
  - identify volume

Alternative C

Berm Upper Bogs, Shallow Well Point Treatment



Legend

Bog | Pond | Wetland | Berm

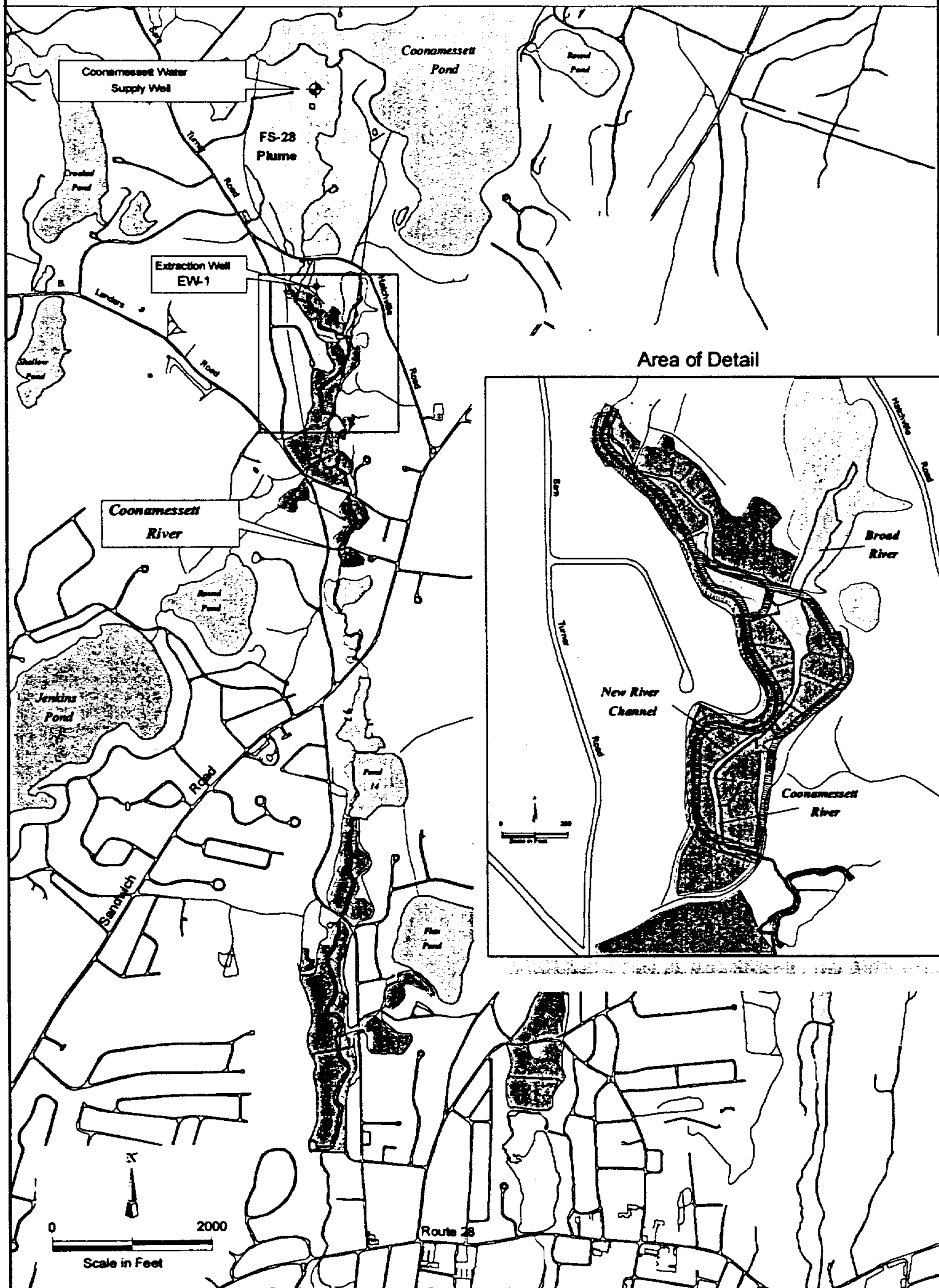
Coonamessett River
Bog Alternative C
Massachusetts Military Reservation
Cape Cod, Massachusetts

Alternative D - EW-1 + Separate All Bogs

- **Continue to operate EW-1**
- **Realign upper bogs**
- **Construct berms on either side of river**
- **Provide alternative flood waters or management water**

- Advantages
  - separates river from active bogs
  - improves the fish migration
  - in line with Town strategy
- Disadvantages
  - no buffer for floods
  - need alternative water sources for flooding

Alternative D Separate All Bogs



Legend

Bog
Pond
Wetland
Isolation Berm
Berm

Coonamessett River
Bog Alternative D
Massachusetts Military Reservation
Cape Cod, Massachusetts

Alternative E - Phased Approach
Upper Baptiste Bogs

Upper Baptiste Bogs - E1 and E2

- One year of non-detect data available for inlet at 69SW0006 and outlet at 69SW0011
- Continue surface water sampling

Upper Baptiste Bog - E3

- Berm east end of bog to isolate from Broad River, add 2 flumes
- Continue surface water sampling

- <u>Advantages</u>
  - E1 and E2 Cranberries are marketable for Fall 99
  - E3 Cranberries are marketable for Fall 00
  - Isolate E3 from river
  - Can be grower implemented
- <u>Disadvantages</u>
  - EDB may upwell into E3 bog
  - May lose minimal bog area due to berm

Alternative E - Phased Approach
Lower Baptiste Bog

Option E1

- Goal to decrease EDB concentrations 10-fold from 0.1 to 0.01 by Fall 99
- Install shallow well points in upper half of bog to capture upwelling
- Reduce EW-1 to 400 gpm
- Treat captured well point flow with remaining 400 gpm capacity at EW-1 plant

- Advantages
  - Little or no loss of cranberry bog
  - May accelerate removal of EDB
  - No ponding of water to limit natural upwelling
- Disadvantages
  - Need pilot test to design adequately
  - May not achieve 10-fold decrease with only 400 gpm
  - Need power source and additional piping to treatment plant

Alternative E - Phased Approach
Lower Baptiste Bog

Option E2

- Goal to decrease EDB concentrations 10-fold from 0.1 to 0.01 by Fall 99
- Develop upper half into a 3 acre holding pond, dig out to depth ~2-5 ft
- Install a fish ladder at holding pond outlet to river
- Lower half remains a cranberry bog

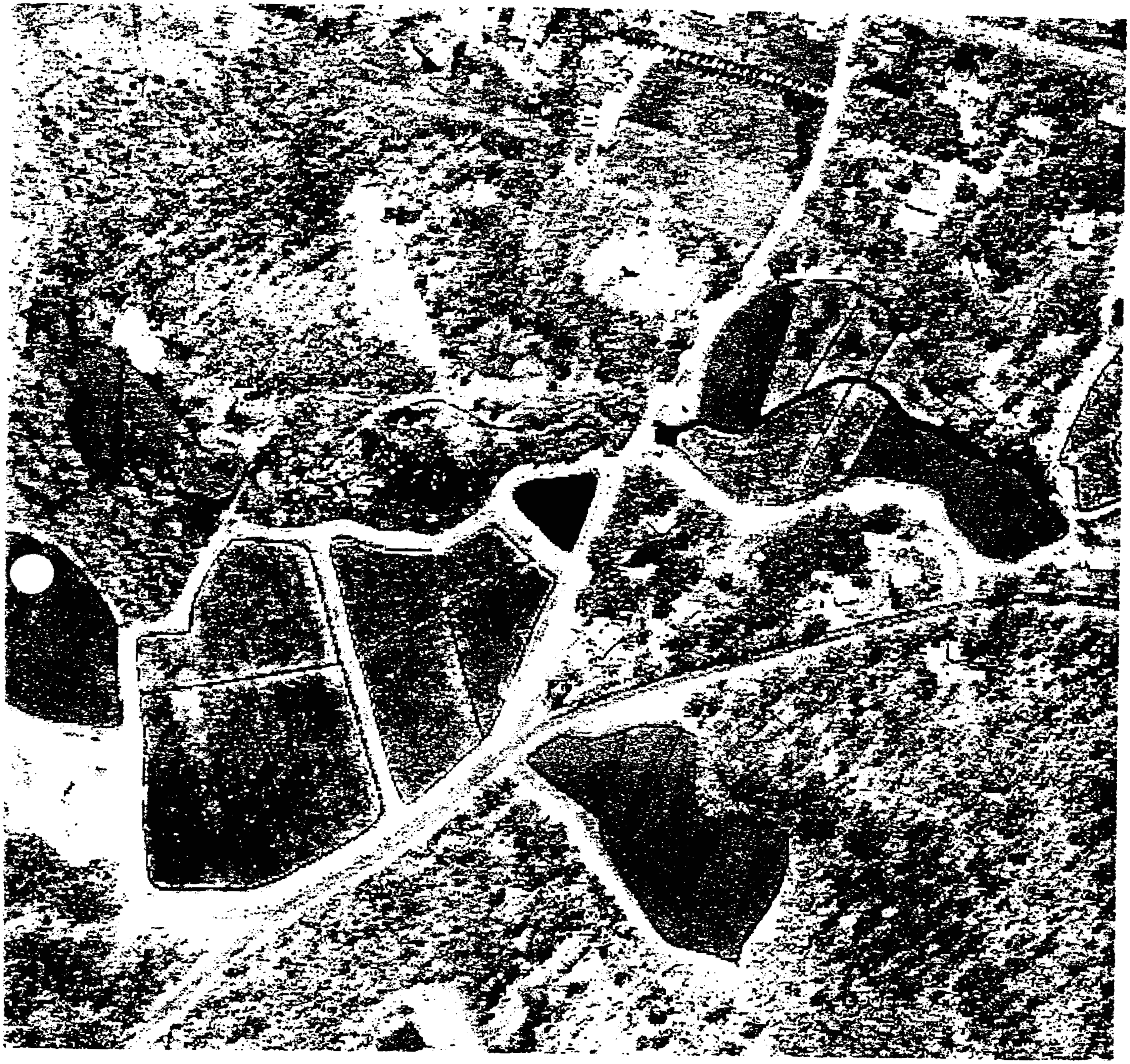
- Advantages
  - Allows degradation of EDB due to detention time in basin
  - Phased approach to reduce unnecessary impacts
- Disadvantages
  - Lose 3 acres of cranberry bog
  - Intrusive actions during excavation may cause siltation
  - Disposal of excavated material
  - May require temporary channel by-pass during construction
  - Must reconstruct bog to use again

Alternative E - Phased Approach
Lower Baptiste Bog

Option E3

- Goal to decrease EDB concentrations 10-fold from 0.1 to 0.01 by Fall 99
- Develop the entire bog into a holding pond, dig out upper half of bog to depth ~2-5ft, continue sw sampling
- If no decrease, dig out lower half ~2-5ft
- Install a fish ladder at 69SW0024

- Advantages
  - Allows degradation of EDB due to detention time in basin
  - Phased approach to reduce unnecessary impacts
- Disadvantages
  - Lose 6 acres of cranberry bog
  - Intrusive actions during excavation may cause siltation
  - Disposal of excavated material
  - May require temporary channel by-pass during construction
  - Must reconstruct bog to use agair



Alternative E - Phased Approach
Augusta Bog

Augusta Bog

- One year of non-detect data available for inlet at 69SW2001 and outlet at 69SW0060
- Provide alternate water source from EW-1 outfall, intercept river upstream, or new well
- Remove 2 weirs to disconnect from river
- Submit Notice of Intent
- Develop a 1 acre (6 ft depth) reservoir for water storage

- <u>Advantages</u>
  - Already separated from river
  - Provides clean water to bog
  - Cranberries marketable for Fall 99
- <u>Disadvantages</u>
  - Without new reservoir, may not be able to flood bogs fast enough in emergency weather situation

Alternative E - Phased Approach
Adams and LaSalle Bogs

Adams Bog

- Berm and flume construction
- Provide alternate water source
- Non-detect data available above river connection
- Submit Notice of Intent

LaSalle Bog

- Berm construction, improve choked channel
- Provide alternate water source
- Low level EDB concentrations in 69SW2014 and 69SW2005
- Submit Notice of Intent

- Advantages
  - Separates EDB from bog
  - Provides clean water
  - Reduce worker exposure to EDB
  - Cranberries marketable for Fall 99
- Disadvantages
  - Erosion control required due to proximity of berm construction to river

Alternative E - Phased Approach West Thompson Bog

West Thompson Bog

- One year of non-detect data available for 69SW2002 and 69SW2003
- Provide alternate water source

- Advantages
  - Bog already separated from river
  - Provides clean water to bog
  - Cranberries marketable for Fall 99
- Disadvantages
  - May need to improve inflow/outflow between West Thompson and Augusta bogs

Alternative E - Phased Approach
East Thompson Bog

Option E1

- Realign channel to west side
- Install a new weir/flume at the end of the bog
- Low level EDB concentrations in 69SW0047 and 69SW0048
- Provide alternate water source
- Submit Notice of Intent

Option E2

- Berm east side of river channel, west side becomes wetlands
- Provide alternate water source

- Advantages
  - Separates EDB from bog
  - Provides clean water
  - New river channel controls water elevations on bordering properties
  - Reduces cranberry worker exposure to EDB
  - Cranberries marketable for Fall 00
- Disadvantages
  - Realignment of river channel
  - May need 404 permit - schedule impact

Alternative E - Phased Approach
Chaston Bog

Chaston Bog

- One year of non-detect data available for 69SW2006 and 69SW2007
- Provide alternate water source
- Relies on East Thompson bog for hydraulic head

- Advantages
  - Already separated from river
  - Provides clean water to bog
  - Cranberries marketable for Fall 99
- Disadvantages
  - Neighbor access issues

Alternative E - Phased Approach
Reservoir Bog

Reservoir Bog
- Low level of EDB in 69SW2008 and 69SW0051
- Install a fish ladder at Pond 14 outlet
- Disconnect Flax Pond inlet to Pond 14

Option E1
- Evaluate existing inlet structure to Pond 14

Option E2
- Install floating baffles in Pond 14 to increase detention time

Option E3
- Improve weir at Pond 14 outfall to raise water elevation ~0.5ft

- Advantages
  - Improved fish migration
  - No intrusive actions in bog
  - Cranberries marketable for Fall 99
- Disadvantages
  - Issues related to raising water level such as impacts to bordering wetlands
  - Floating baffles may be difficult to install on borders

Alternative E - Phased Approach
Middle Bog

Middle Bog

- No action proposed
- Low level of EDB in 69SW0051 and non-detect data for 69SW0052

- Advantages
  - No changes to bog
  - Cranberries marketable for Fall 99
- Disadvantages
  - None

MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

Coonamessett

Alternative E - Phased Approach
Lower and Flax Pond Bogs

Lower and Flax Pond Bogs

- No action proposed
- One year of non-detect data available for 69SW0052, 69SW2009, 69SW2011, and 69SW2012
- Test berries at Flax Pond bogs, send to market

- Advantages
  - No changes to bog
  - Cranberries marketable for Fall 99
- Disadvantages
  - None

Installation Restoration Program

Bog Alternatives Summary

- Upper Bogs (~26 acres)
  - Buy Out (A)
  - Separate Bogs/Alternate Water Source (B,D,E)
  - Treatment (Active or Passive) (C,E)
- Lower Bogs (~38 acres)
  - Dependent on action in upper bogs

MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

Upper Bog Response Actions

Easiest to Implement

- Upper Baptiste (E1, E2) - 2 acres
  - No action Needed
- Augusta, Chaston, West Thompson - 10 acres
  - Bogs already separated
  - Provide Alternate Water Source
- Upper Baptiste (E3), Adams, LaSalle - 4 acres
  - Bogs not separated
  - Berm and Provide Alternate Water Source

MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

Upper Bog Response Actions

More Complex/Difficult to Implement

- East Thompson - 3 acres
  - Bog not separated
  - Realign channel/Berm/Alternate Water Source
- Lower Baptiste - 6.6 acres
  - Treatment - Active or Passive

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FS-28 Coonamessett River

Upper Baptiste Bog (E1)
Surface Water Data Non-Detect, Continue Collecting Surface Water Data, Berries Marketable in Fall 99

Lower Baptiste Bog (E4)
Option #1
A) Conduct **Shallow Well-Point Pilot Test** in Upper Corner of Bog, If Pilot Test Shows Can Achieve 10-fold Decrease From 0.1 to 0.01, Reduce EW-1 Pump Rate to 400 gpm, Treat Well-Point Captured Flow with Remaining Capacity of 400 gpm at EW-1 Treatment Plant, Continue Collecting Surface Water Data.

B) If Pilot Test Does Not Achieve 10-Fold Decrease Using 400 gpm, Expand Into a **Full-Scale Well-Point Extraction & Treatment System** to Capture Upwelling, Requires ~1800 gpm Expansion of the Current EW-1 Treatment Plant.

Augusta Bogs (G1 &G2)
Surface Water Data Non-Detect, Bog is Already Separated from River, Provide Alternate Water Source From EW-1 Pipeline, Develop a 1 Acre (6ft Depth) Reservoir for Water Storage, Continue Collecting Surface Water Data

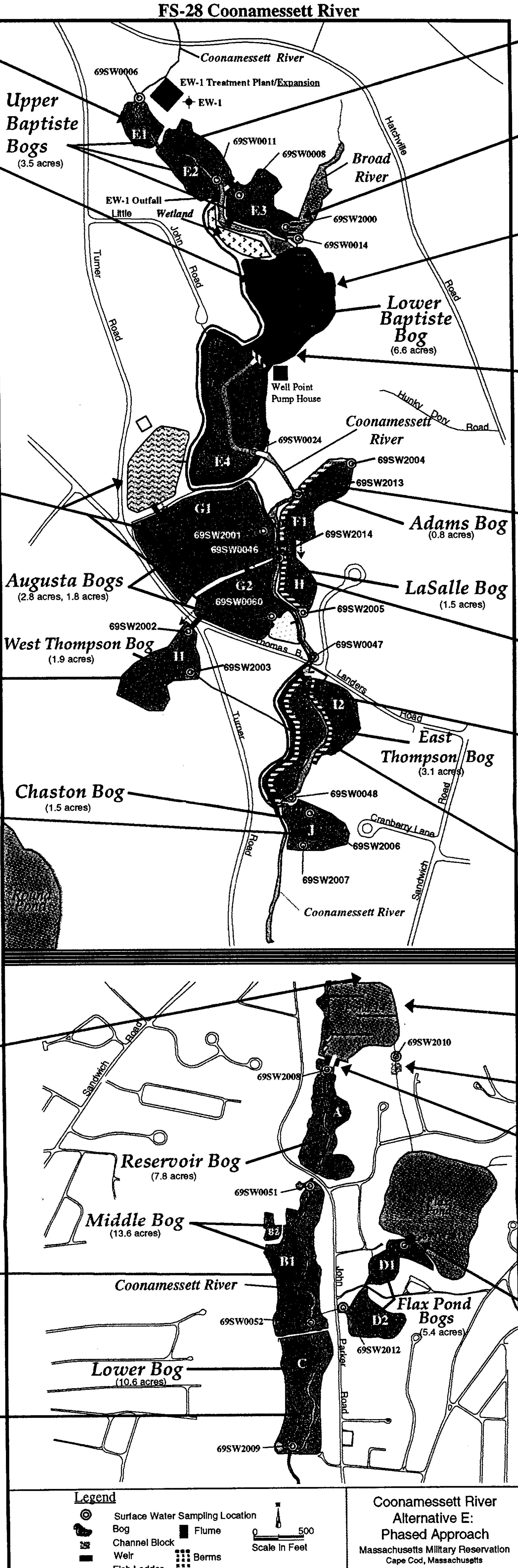
West Thompson Bog (I1)
Surface Water Data Non-Detect, Bog is Already Separated from River, Provide Alternate Water Source From EW-1 Pipeline Through Augusta Bog, Continue Collecting Surface Water Data

Chaston Bog (J)
Surface Water Data Non-Detect, Bog is Already Separated from River, Provide Alternate Water Source From EW-1 Pipeline, Eliminate Water Loss From Bog, Continue Collecting Surface Water Data

Reservoir Bog (A)
Option #1
Evaluate Existing Structure at Inlet to Pond 14 as a Means of Increasing Detention Time or Decreasing Short Circuiting, Improve Fish Ladder at Pond 14 Outlet, Disconnect Pond 14 Outfall to Flax Pond, Continue Collecting Surface Water Data, Test Berries, *Marketable in Fall 99*

Middle Bog (B1 & B2)
Continue Collecting Surface Water Data, Test Berries, Marketable in Fall 99

Lower Bog (C)
Surface Water Data Non-Detect, Continue Collecting Surface Water Data, Test Berries, Marketable in Fall 99



Upper Baptiste Bog (E2)
Surface Water Data Non-Detect, Continue Collecting Surface Water Data, Berries Marketable in Fall 99

Upper Baptiste Bog (E3)
Berm East End of Bog E3 to Isolate From Broad River, Install 2 **New Flumes**, Continue Collecting Surface Water Data, Berries Marketable in Fall 00

Lower Baptiste Bog (E4)
Option #2
Develop Upper Half of the Lower Baptiste Bog into a 3 Acre (2-5 ft Depth) Holding Pond, Install a Fish Ladder at the Holding Pond Outlet to the River, Continue Collecting Surface Water Data

Lower Baptiste Bog (E4)
Option #3
Develop the Entire Lower Baptiste Bog into a 6 Acre (2-5ft Depth) Holding Pond, Install a Fish Ladder at Station 69SW0024, Continue Collecting Surface Water Data

Adams Bog (F1)
Berm West Side of Bog to Separate it from the River, Provide Alternate Water Source From EW-1 Pipeline, Continue Collecting Surface Water Data

LaSalle Bog (H)
Berm West Side of Bog to Separate it from the River, Improve Choked Channel, Provide Alternate Water Source From EW-1 Pipeline, Continue Collecting Surface Water Data

East Thompson Bog (I2)
Option #1
Realign Channel to West Side, Install a Weir at the End of the Bog, Provide Alternate Water Source From EW-1 Pipeline, Continue Collecting Surface Water Data

East Thompson Bog (I2)
Option #2
Berm East Side of River Channel, West Side Becomes Wetlands, East Side Remains Cranberry Bog, Provide Alternate Water Source From EW-1 Pipeline, Continue Collecting Surface Water Data

Reservoir Bog (A)
Option #2
Install Floating Baffles Across Pond 14 (or plants) to Increase Detention Time and to Decrease Short Circuiting, Disconnect Pond 14 Outfall to Flax Pond, Continue Collecting Surface Water Data, Test Berries, Marketable in Fall 99

Reservoir Bog (A)
Option #3
Improve the Weir at Pond 14 outfall to Raise Elevation ~Half Foot, Improve the Fish Ladder at Pond 14 Outlet, Disconnect Pond 14 Outfall to Flax Pond, Continue Collecting Surface Water Data, Test Berries, Marketable in Fall 99

Flax Pond Bogs (D1 & D2)
Improve Flume at Flax Pond Outlet for Fish Migration, Continue Collecting Surface Water Data, Test Berries, Market FY98

14-Sep-98

(7)

21 SEPTEMBER 1998 MEETING MINUTES, PRESENTATION HANDOUT

FS-28 Coonamessett River Stakeholder Summit
September 21, 1998
Christ the King Parish, Mashpee
1:30 PM - 4:30 PM
Meeting Minutes

Attendee:	Organization:	Telephone:	E-mail:
Nancy Balkus	AFCEE	508-968-4670, x-4676	Nancy.balkus@hqafcee.brooks.af.mil
Tom Szymoniak	Jacobs Engineering	508-564-5746	Tom.szymoniak@jacobs.com
Joan Miles	US EPA	617-565-3699	
Matt Schweisberg	US EPA	617-565-4431	
Bob Lim	US EPA	617-223-5521	
Cathy Kiley	MA DEP	508-946-2839	
Len Pinaud	MA DEP	508-946-2871	
Steve Spear	USDA NRCS	508-771-6476	
Allan Gordon	Falmouth Conservation Commission	508-289-2484	agordon@whoi.edu
Jo Ann Muramoto	Falmouth Conservation Commission	508-548-7611	
Peter Boyer	Falmouth Conservation Commission	508-548-7611	
David McMindes	AFCEE	210-536-5214	
Roger Wilkson	AFCEE		
Greg Braun	MDPH	508-968-4950	
Jeff LaFleur	Cape Cod Cranberry Growers Assn.	508-295-4895	
Tom Bicki	Ocean Spray	508-946-7128	
Steve Hurley	MDFW	508-759-3406	
Joe Costa	BBP/MCZM	508-291-3625	joe.costa@state.ma.us
Dick Taylor			
Donald Mack	Falmouth resident	508-564-4393	
Nancy Mack	Falmouth resident	508-564-4393	
Gail MacRae	Hatchville resident	508-540-1202	
Richard Koehler	Falmouth resident	508-540-0332	rkoehler@capecod.net
Brian McDermott	Falmouth resident		
Jeff Burt	*Cape Cod Times*	508-548-9300	
Amy Lipkind	CH2M Hill	508-968-4678	
Sarah Corner	OpTech	508-759-6989	

Facilitator:	Organization:	Telephone:	E-mail:
Pat Field	CBI	617-492-1414	

Agenda Item #1. Introductions, Goals of Meeting, Groundrules, Agenda Review

Mr. Field convened the meeting at 1:30 PM and asked the attendees to introduce themselves. He thanked everyone for coming and reviewed the agenda and the groundrules. He noted that the goal of the meeting was to achieve, if possible, a consensus or focus on a preferred alternative or alternatives for moving forward with plans for the Coonamessett River.

Mr. Field then introduced **Ms. Balkus** of the Air Force Center for Environmental Excellence (AFCEE). **Ms. Balkus** noted that there would be some real opportunities to excel during the week. On Friday, AFCEE would have an opportunity to update the Massachusetts congressional delegation on the status of the Massachusetts Military Reservation (MMR) program, including the cranberry projects. She asked for the cooperation of the attendees and noted that whatever consensus they were able to come to would be passed on to the delegation.

Agenda Item #2. Outcome of Falmouth-Sponsored Meeting

Mr. Field introduced **Mr. Gordon** of the Falmouth Conservation Commission. **Mr. Gordon** read a letter that the Commission had sent to AFCEE. The letter stated that the Commission had held a public meeting on September 16, 1998 to discuss AFCEE's proposed options for remediation of ethylene dibromide (EDB) contamination in the Coonamessett River. The Commission commended AFCEE and Jacobs Engineering for the thorough investigation that had been conducted to date and their efforts to convey complex information in a comprehensible manner. The letter also indicated that the Commission had voted to recommend the process that resulted in Alternative E. This recommendation evolved from continuing discussions and new information as it had become available. The letter outlined additional elements, which the Commission wished to add to Alternative E. Mr. Gordon stated that the Commission endorsed the continuation of the process and expected to actively participate in future discussions with Air Force officials.

Mr. Field asked if there were any questions about the Commission's recommendations. **Ms. Muramoto** reiterated that the Commission voted in favor of Alternative E plus both compensation and complete separation of the river from the bog system. She clarified that Alternative E alone does not have those two extra elements. She stated that the Commission voted to strongly support the processes that lead to these two elements and noted that public involvement in the process was an important part of the entire matter.

Agenda Item #3. Discussion

Mr. Field asked **Mr. Szymoniak** to summarize the alternatives, focus in on Alternative E, delineate any questions or concerns, and provide more details.

Mr. Szymoniak summarized the alternatives as follows:

Alternative A: **Mr. Szymoniak** described this as the "buy-out" alternative. He also mentioned that all of the options included Extraction Well 1 (EW-1), an operation at Hatchville Road running at the current rate of 600 gallons per minute (gpm).

Alternative B: **Mr. Szymoniak** stated that this plan involved channel realignment in the Baptiste Bog from the beginning of the upper baptiste bogs all the way through the entire lower baptiste bog. Portions of the lower baptiste bog would be realigned in order to create two different berms on either side of the bog, which would become holding basins for passive treatment of the bogs via ponding river water within the holding basins.

Alternative C: **Mr. Szymoniak** noted that this alternative included the same channel realignment as Alternative B, but added active treatment using shallow well points to extract EDB where it is upwelling into the lower baptiste bog. The water would be taken back for treatment at an expanded EW-1 plant and discharged at four locations downstream throughout the river system.

Alternative D: **Mr. Szymoniak** said that this option would entail separation of all the bogs in the river system via berms, and treatment would not be required since EDB would only be present in the river and not in the bogs. One of the goals with this option would be to get water flowing into Pond 14 to be non-detect. Based on word from Ocean Spray that this may or may not be acceptable, AFCEE reasoned that if the bogs can be separated from the river, it may be acceptable to have some low level of EDB in the river from a long-term marketability standpoint. Mr. Szymoniak noted that this could be discussed further.

Alternative E: **Mr. Szymoniak** noted that the upwelling of EDB occurs at the confluence of Broad River and the Coonamessett River. There are some bogs that are already separated from the river channel including the Augusta, West Thompson and Chaston Bogs. An alternative water source would be necessary so these bogs would have clean water for fall harvesting and winter protection. In order to keep improving on that, the upper baptise bog E-3 could be non-detect if it could be disconnected from the Broad River by berming along the channel. The Adams and Lassalle Bogs would be separated from the river as well with berms or sheet piling. As an alternative water source in the upper river system, Mr. Szymoniak proposed using treated water from the EW-1 treatment plant. He clarified that there would be no use of Round Pond in the current alternative. On the East Thompson Bog, either the channel would need to be realigned or a berm installed on the eastern side of the existing river channel in order to separate

the river from the bog. In this particular option, all of the bogs would go back into production with the exception of the Lower Baptiste Bog and perhaps a portion of the East Thompson bog. The lower baptiste bog would become one of the areas that would be used for the treatment system. The treatment would be shallow well points to lower the concentrations. The end result would not be non-detect, but it would lower the concentration ten-fold to about 0.01 leaving this particular bog. The goal would be to get the water that flows into Pond 14 to be non-detect. Although Alternative E would allow for some EDB in the river, the concentration would be lowered by adding clean water from EW-1 to the river or by maximizing the treatment of the groundwater from the shallow well points.

Mr. Szymoniak noted that reducing the concentrations of EDB in the upper river system would positively impact the surface water concentrations at Pond 14. All of the lower bogs could come back into production because the water that would be used for these bogs and the river itself would be non-detect. It would be necessary to do a tracer test to determine how water flows through Pond 14. The goal would be to get the water entering and leaving Pond 14 to be non-detect. This would make Flax Pond non-detect.

With the alternatives briefly summarized, **Mr. Szymoniak** noted that the entire Coonamessett bog system represented some 86 acres. The different options being considered include no action, buyout; the separation of the bogs included in alternatives B, D, and E; and the addition of treatment included in alternatives C and E. With his understanding of the plume's migration, Mr. Szymoniak did not believe that the lower portion of the contamination would upwell and be detectable in the surface water. As a result, he did not propose at this point to deal with the plume that was located beneath the Augusta Bog. He explained that the shallow groundwater and surface water in the upper bogs flowed into the lower bogs, so any action taken in the upper bogs would improve the lower bogs and bring them back into production.

Mr. Szymoniak explained that some of the options within Alternative E were easier to implement than others. He noted that clean water flowed through the upper Baptiste Bogs, E1 and E2 on the attached map; there is no EDB upwelling in those and they should be able to go back into production immediately. He stated that the Augusta Bog, the Chaston Bog and the West Thompson Bog are already separated from the river, but need an alternate water source. The Upper Baptiste Bog (E3), along with the Adams and Lassalle Bogs, still needed to be separated from the river and would also require an alternate water source.

Mr. Szymoniak then went on to address the more complex options within Alternative E that would be more difficult to implement. He explained that there were two possibilities with the East Thompson Bog are being considered. One includes moving the river channel to the west side and adding a berm on one side to keep the EDB, which may exist in low concentrations in the river, isolated from the cranberry bog. Another alternative for the East Thompson bog is to install a berm on the east side of the current river channel so that the river is disconnected from the active bog. Another complex option involves the lower Baptiste bog, which represents 6.6 acres. He suggested that this could be used as a treatment cell, either actively or passively. Shallow well points would be used for active treatment, however the necessity of expanding the EW-1 treatment plant needs to be examined.

Mr. Szymoniak stated that AFCEE's preferred alternative was to berm the Upper Baptiste (E3), Adams and Lassalle Bogs; and install shallow well points in the Lower Baptiste Bog in an effort to utilize the existing capacity of the EW-1 treatment plant. EW-1 pumping rate would be reduced to 400 gpm. The excess 400 gpm (out of the total capacity of 800 gpm) would be used to treat the shallow well point extracted water. He noted that realigning the channel in the East Thompson Bog would be beneficial to nearby property owners. An alternate water source would be provided using EW-1 treated water within the bogs that had been discussed (Augusta, Adams, Lassalle, East and West Thompson, and Chaston). He added that the weir at Pond 14 would be evaluated and improved if necessary.

Mr. Field summarized the alternatives that Mr. Szymoniak had discussed. He noted that the goal was to get Pond 14 to non-detect. He identified the question of alternate water sources and asked whether there was any kind of storage that was required in order to provide the necessary amount of water.

Mr. Szymoniak replied that the amount of alternate water was a function of time that was needed to fill the particular bogs. He stated it had never been resolved how much time was needed because it can be weather dependent. At 600 gpm, it would take several days to fill the bogs and all of the bogs could not be filled at once. The purpose of the proposed storage reservoir on the Augusta property would be to provide additional capacity to

fill the large Augusta bogs. He added that the bogs requiring an alternate water source totaled some 12 acres and a considerable volume would be necessary to fill them all at once. **Mr. Field** clarified that one of the options for an additional alternate water source was a storage reservoir to provide more water at any one time. Mr. Szymoniak responded that the reservoir would be about 1.5 acres. He explained that it would store about eight acre feet. However to fill all of the bogs, it would require twelve to fourteen acre feet. He concluded that the reservoir would have enough capacity to fill the larger bogs.

Mr. Field asked Mr. Szymoniak to explain the treatment that would occur at the Lower Baptiste Bog. **Mr. Szymoniak** responded that the pond could act as either passive or active treatment. He noted that the active treatment would be the same granular activated carbon (GAC) treatment at EW-1. The passive treatment would include ponding and dilution of the water itself. He noted that not all of the water that had upwells into the bog area is contaminated.

Mr. Field noted the question of whether to berm the river or relocate the channel to the west side of the East Thompson Bog. Mr. Szymoniak said those were both options. Mr. Field remarked that the town had proposed additional berming further down the channel on the lower bogs. He explained that AFCEE felt this might be unnecessary since the water would be non-detect. He said that the town favored additional berming for fishery protection and pathway separation from the bog. Mr. Field also mentioned the town's preference, in the short or long-term, that pieces of the bog system that were removed from production would receive compensation. He opened the meeting to comments and questions from the attendees.

Mr. Taylor asked how the holding ponds decrease the EDB concentration. **Mr. Szymoniak** replied that not all of the water is contaminated, but rather water mixes in the bog. **Mr. Taylor** asked how that would decrease the concentration that was currently in the river. **Mr. Szymoniak** replied that the water is diluted and if it could be controlled hydraulically, the concentration could be changed. He said this was a passive treatment scenario that would take longer than active treatment.

Ms. Mack identified herself and her husband as Falmouth residents. She noted that their property overlooked the Lower Baptiste Bog and expressed her concern over flooding the bogs. In the past, there were a couple of occasions when the bogs were over-flooded and the water went onto her property. She stated that Mr. Handy had been very responsive in draining it and there was never a serious problem. She noted that she had heard nothing in the day's discussions about the residents and taxpayers in the area. She asked if this would affect their septic systems. She also asked what the treatment of the lower bogs would entail. Ms. Mack stated that residents who were overlooking the bogs were concerned about "big, ugly piping systems."

Mr. Mack added that he was concerned about the possibility of EDB in the water and noted that two dogs in his neighborhood had died of cancer. His own dog recently had a cancerous tumor removed as well. He asked if, when the bogs were flooded, the water would be stagnant or allowed to overflow. **Mr. Szymoniak** clarified that the Macks were worried about stagnation of the water, the effects of ponding on the septic systems and that there may be flooding that would affect their property. **The Macks** said this was correct.

Mr. Szymoniak stated that the river would still flow through this particular pond. He noted that it was actually preferable for the EDB to keep coming up. Ideally, low levels of water ponding would quicken the flushing out of the EDB. He noted that lower levels of water would also lessen the likelihood that the Macks' property would be affected. He explained that the treatment would be staged so small areas would be done at a time and it would be controlled by a weir to keep levels in the river low. He said the goal was to try to reduce the concentration, but this could not be done unless the EDB was removed or more clean water was added. He added that those options were limited, leaving the shallow water pool as a viable alternative.

Ms. Mack asked whether the EDB would rise into the air. **Mr. Szymoniak** stated this was occurring right now. He reiterated that the EDB is upwelling into the bog itself. He noted on the conceptual model that the plume was flowing fairly deep underground. He pointed out that just south of Hatchville Road, the EDB began to upwell in the river. He also said that there was another portion of the plume under the Augusta Bog. Mr. Szymoniak then stated that air sampling had been done over an eight-week period last August and the concentrations of EDB were not very high. He clarified that the concentrations were not considered by the Massachusetts Department of Public Health (MDPH) to be a risk. He added that with EW-1 operating, there was already a noticeable reduction in the

concentrations from last year. Therefore, any ponding would produce lower concentrations than what was present a year ago and would not be a risk. He remarked that it was a very good question.

Ms. Mack reiterated her concern over the number of animals in their area that had been diagnosed with cancer. She noted this was a valid concern as they were overlooking the Lower Baptiste Bog and constantly breathing in the air. **Mr. Szymoniak** reminded her that the levels of EDB would probably be lower than what had been sampled last year.

Ms. Mack stated that she wanted to go on record as being in support of leaving the bogs as conservation land for the animals and people to enjoy. **Mr. Szymoniak** responded by identifying on the map (see attachment #1) the bogs that would go out of production because there was no way to separate them from the river. He noted that because it was not a viable solution to realign the river and make the bogs treatment basins, Alternative B had been developed. He stated that six acres could be reverted back to a wetland.

Ms. Mack asked if the bog would be minimally flooded in the event that flooding was indeed necessary. **Mr. Szymoniak** stated that would be the intent, however he did not know at what level it would need to be flooded. He noted that the entire bog would be ponded in order to lower the concentration. Ms. Mack expressed her concern about the impact of flooding the bogs on her septic system. She noted that she had always contacted Mr. Handy in the past if there was a problem. She asked who would be in charge when a problem developed. Mr. Szymoniak commented that this was a good question. He noted that just the remedial system was being discussed now and clarified that Ms. Mack wanted to know who to contact if the water was flooded to an unacceptable level. He asked Mr. Field to write her question on the board.

Mr. Mack asked about berming the river. **Mr. Szymoniak** stated that there were no berms with this alternative. He explained that the bog would remain unchanged, however an attempt would be made to actively or passively treat the areas where the EDB was upwelling in an effort to lower the concentrations. **Mr. Mack** asked if the water would still flow down the river. **Mr. Szymoniak** acknowledged there would still be EDB in the river, although the goal was to get it to a level such that downgradient would be non-detect. **Mr. Mack** asked what effect a heavy rain would have in terms of over-flooding the area. **Mr. Szymoniak** replied that the bog would drain as it did now. He added that dilution was not necessarily the preferred answer because it would take longer for the EDB to come out.

Mr. Mack asked who would be responsible for maintenance around the bog. He also expressed his concern over the wiring and pipes that would be brought in for treatment of the bog. **Mr. Szymoniak** responded that if shallow well points were used, the well points themselves were about an inch and a half in diameter. He explained there would be header pipe on top of the bog surface, but all of the pipes that brought water back to EW-1 would be buried. He noted that power would be necessary for the pumps and indicated on the map where power poles would be located. **Mr. Mack** commented on the beauty of the area and the wildlife he had observed around the bogs. He concluded that it would be a shame to lose it.

Mr. Costa commented that the Falmouth Conservation Commission recommendation of a modified version of Alternative E where the entire river system was separated from the bogs made sense. He recognized that with the EDB contamination, the Commission would be looking for ways to deal with fish management and run-off issues. He observed that Mr. Szymoniak seemed to be stating that if Pond 14 were clean, berming the lower bogs would be unnecessary. He noted that berming the lower bogs could be viewed as insurance in case Pond 14 did not turn out to be clear. He asked if there was anything in the Superfund process that precluded paying for the berming of the lower bogs.

Ms. Balkus replied that she was not sure that the Superfund process would preclude it specifically. She said that she would need to speak with the lawyers to be sure. She also stated that if it was shown from an engineering standpoint that Pond 14 was non-detect, environmental funds would potentially be spent "cleaning up" EDB that was not in the lower bogs. She stated that she did not know if there was another way to show the beneficial aspects of berming, such as separating the river and keeping the pesticides from the bogs out of the river system and fisheries. She agreed it was a good idea, but was not sure if AFCEE could do that under the Superfund process.

Ms. Kiley asked Ocean Spray to re-state its position with regard to EDB in the water. **Mr. Bicki** stated that Ocean Spray's official position was to have the cranberries growing in or coming in near contact with non-detect water. He

noted that if option one of Alternative E, which included the shallow well points, could result in non-detect levels of EDB, it would solve the problem in terms of all the other bogs. If not, he noted that there would still be a question of marketability of the fruit coming in close contact with contaminated water. He added that it was hard to say how consumers would react given all the publicity on this issue. **Mr. Szymoniak** stated it might not be possible from a liability standpoint to get non-detect. He added that separating the bogs and providing an alternate water source did not necessarily mean that non-detect water in the river above Pond 14 would be achieved. **Mr. Bicki** stated that Ocean Spray was unsure about the upper sections, but the non-detect area below Pond 14 fell within the guidelines of marketability.

Mr. Field summarized by stating that the water in the Lower Baptiste Bog may not get to non-detect. **Mr. Szymoniak** concurred that this was correct unless a large volume of water, about 1500 gpm, could be pumped to keep up with the river. He added that this option was not feasible in that a large volume would have to be pumped without a guarantee of non-detect. He suggested pumping in a few specific areas where the upwelling occurred rather than attempting to pump a large volume.

Mr. McDermott stated that he had read that the Air Force wanted to be out of the cranberry business by the year 2000. He also recalled a claim made by the Air Force that there was no EDB found in the cranberries after the pre-test. He commented that the protocol that was in place for the pre-tests was developed by the state, AFCEE and the Food and Drug Administration (FDA). He questioned what would happen if the protocol testing was completed and, although the EDB was present in low levels in the water, it was shown that EDB could not enter the fruit through the roots or skin. Mr. McDermott expressed his concern that if there were no threat to human health, the Air Force would refuse to compensate the growers and would leave them to deal with Ocean Spray and the other purchasers. **Mr. Field** suggested that **Mr. Braun** from the MDPH explain any relevant protocols or guidelines and turn the rest of the question over to Ms. Balkus.

Mr. Braun clarified that the protocols were strictly analytical, a methodology to do analysis on fruit. He stated that Massachusetts had a non-detect standard for fruit as well as for many other food items. He noted that results of the Kansas State University studies would not be available for over a year and any action could not be taken until then. He explained that the testing protocol had been reviewed and audited by members of the Air Force, the state lab, the MDPH and the US EPA.. He stated that a consensus had been reached that the lab chosen by the Air Force was suitable and capable of completing the analysis, therefore everyone should be comfortable with the results. He noted there was some concern about "split analysis."

Mr. McDermott reiterated his concern over whether the Air Force was committed to EDB-free water or to just meeting the standard set by the state. **Mr. Field** rephrased the question by asking if the result was that the cranberries were non-detect, would the Air Force be concerned about EDB in the water.

Ms. Balkus clarified that the intent of the bog project was to address the time period between the present and when it was determined that there was no EDB in the fruit and no possible way it could get into the fruit. She explained the two Air Force-sponsored research studies to be completed by Kansas State University: The first study would entail floating cranberries in surface water containing different concentrations of EDB to determine at what level it would be possible for EDB to enter the fruit, or if it would enter the fruit at all. The results of this study would be available in January of 1999. The second study involved determining whether a plant grown in a controlled environment could absorb EDB from the water through the roots or vines, transfer it into the flower, and eventually be present in the fruit. Because this study requires the plant to go through a complete life cycle, Ms. Balkus stated that the preliminary data would not be available until the year 2000. In order to make the process an actual research study that was verifiable, the growth effort has to be repeated. The complete results would be available in 2001. She noted that studies on other plants showed almost overwhelmingly that EDB could not make it into a plant, but there was not a specific cranberry study. She noted that, in the interim, the Air Force wanted to take an action that would ensure the return of the cranberry bogs to production. She concluded that after an action was taken and the data was obtained from Kansas State University, the Air Force could say it had done everything it could to return the river system to a productive market, but could not guarantee that Ocean Spray would purchase the crop.

Mr. McDermott agreed with her explanation, but asked why taxpayer money would be spent on a remedy that may be considered unnecessary in two years. Ms. Balkus noted that it was more cost effective to implement a corrective action that reduced or controlled the contamination, rather than continue to pay for the crop.

Mr. McDermott asked why the Adams Bog was being treated. **Mr. Szymoniak** noted the location of the plume on the map and stated that it would take longer than two years to achieve non-detect water. He thought it would be closer to five to seven years. **Mr. McDermott** asked again what the Air Force's position would be if the Kansas State University research indicated that it was impossible for EDB to get into the berries. **Mr. Szymoniak** asked if Mr. McDermott was suggesting that the Air Force compensate growers until the results of the studies came out. Mr. McDermott remarked that he personally did not think the bogs should be in production and that the growers should be "realistically" compensated. He noted that if it were shown that EDB could not get into the berries through the skin or roots, the amount of EDB in the river would not make a difference. Mr. Szymoniak noted that there were abutters to the bogs that wanted the EDB removed from the river. Mr. McDermott reiterated his concern that the Air Force would leave the cranberry growers to deal with Ocean Spray and other buyers if it was found that EDB could not enter the fruit because the Air Force could say there was no way it had spoiled the crop.

Mr. Field noted that this was a very important question and asked if the Air Force wanted to answer it now. Mr. Szymoniak noted that there were many "what ifs?": what if the concentrations could not be reduced, what if the concentrations began to increase, what if EW-1 was not as effective as initially thought. **Mr. McDermott** stated that he was advocating that the growers be realistically compensated. **Mr. Szymoniak** stated that the Air Force was trying to restore the river to what it had been.

Mr. Gordon commented that he thought the MDPH had ordered the Air Force to provide EDB-free water not only for production of the fruit, but for the health of the farmers. **Mr. Braun** said he did not recall any order for the military to remove all of the EDB. He clarified that the MDPH was concerned about EDB exposure to workers, the bogs on the Coonamessett River, and long-term exposure to people who lived in the area. He added that this was just another unknown to add to Mr. Szymoniak's list of unknown variables. Mr. Braun remarked that although it did not believe there was an immediate health risk, the MDPH preferred to take corrective action sooner rather than later.

Mr. Taylor concurred that the real question was whether the Air Force would be responsible for the perception problem. Although the concentrations of EDB could be found to be low enough, the cranberries would not be purchased because of the perception problem. He asked whether the Air Force would continue to compensate cranberry growers if this were the case. **Mr. McDermott** thought the Air Force would say the problem was with Ocean Spray.

Mr. Boyer thought that the issue was much more complicated than Mr. McDermott suggested. He then noted he wanted to clarify a few points. He asked Mr. Szymoniak whether he understood correctly that in the Lower Baptiste Bog, there would be several extraction points, the active model would be running through EW-1 for treatment and then would be part of the alternative water supply for various functions of the bogs. **Mr. Szymoniak** said this was correct. **Mr. Boyer** noted that in the active treatment of that segment, there needed to be some form of holding pond in order to get the acre feet, depending on timing or winter flooding, or some calculated reserves to get the water to the appropriate place. **Mr. Szymoniak** said this was correct and explained that the bogs currently relied on the river to flood, so the reserve capacity would be an added benefit, rather than a necessity. **Mr. Boyer** stated this would be an additional treatment since there would continue to be some upwelling in the upper bogs, but would possibly be non-detect once the water came through the Lower Baptiste. **Mr. Szymoniak** said this was correct and had been demonstrated in a year and a half's worth of surface water data.

Mr. Boyer summarized the decision before the group. He thought that a consensus was forming with respect to Alternative E, with the incorporation of some of the Conservation Commission's suggestions. Specifically, if the Upper Baptiste Bogs could be weired off with passive treatment, the real decision was what to do with the Lower Baptiste Bog: extraction and treatment or dilution. He thought that realigning the channels was not a feasible solution. He suggested berming the East Thompson Bog, incorporating the shallow well points to extract and treat as much of the bog as possible and using the treated water as an alternate water source. He asked Mr. Szymoniak if there were questions remaining about the offered solutions that would delay the decision-making process. **Mr. Szymoniak** thought that perhaps the preferred alternative should not have been included in the presentation, as it had dictated their thinking all along. He said that it would be easier to realign the channel on the opposite side of what Mr. Boyer suggested. He also stated that the disadvantage of this option was that the Chaston bog relied on the East Thompson Bog to be proportionately flooded. However, he noted that clean water from the treatment system

could be added and a smaller pond would not necessarily be needed to provide water.

Mr. Boyer suggested developing a consensus regarding the treatment and berming of the East Thompson Bog and then ending the meeting. **Mr. Szymoniak** remarked that removal of the weir might be a good idea from a fisheries standpoint. He explained that if this option were chosen, the area could be returned to a natural wetland that would help the fish migration pathway.

Mr. Field noted his understanding that there were people at the meeting who favored buying out the bogs and allowing them to return to their natural state. However, he asked whether those attendees who preferred Alternative E or a phased Alternative E favored the shallow well treatment or a more passive treatment. **Mr. Gordon** stated that the Falmouth Conservation Commission wanted a passive treatment, or at least a softer approach. He suggested increasing the capacity of EW-1. **Mr. Szymoniak** clarified that a method of extraction could be implemented to utilize the remaining capacity of EW-1. He asked if Mr. Gordon meant that some form of active treatment could be carried out as long as the treatment plant did not need to be expanded. **Mr. Gordon** said he thought that should be the first step. **Mr. Szymoniak** concluded that there should be a phased approach and suggested staying with the current plan: a combination of active and passive treatment to lower EDB to the desired levels, specifically using shallow well points, utilizing the full capacity of EW-1 and then looking at a passive approach to lowering the levels of EDB.

Mr. Field summarized by stating that for the attendees who preferred Alternative E, a phased approach including active and passive treatment was favored. He noted that Mr. Boyer's second question was whether there was a preference for berming or realignment of the channel. He confirmed that Mr. Boyer was against realignment of the channel. Mr. Boyer noted that from an administrative point of view, the permitting itself would be an elaborate and time-consuming event. He added that it was a "cleaner, quicker and less ambiguous solution to simply hold on to the eastern half and let the western half go."

Ms. Balkus stated that AFCEE preferred the western channel because there was already a channel there. Because of this, she thought the realignment might fall under an agricultural exemption in which the Town and the Air Force could work out an agreement, which could be implemented by Mr. Handy. She said that it would reduce the permitting required because Mr. Handy would just be berming off and making the perimeter trench a bypass of that bog operation. She noted that this option of putting the river on the west side of the bog would limit the flooding in the area. She reiterated the benefits to the fisheries that Mr. Szymoniak had mentioned, including the removal of the weir. **Ms. MacRae** recalled that Mr. Montague, the shellfish warden, had favored leaving the channel as it was. She stated she had a great interest in the East Thompson Bog because her home was right there. She said that she preferred that the berming be done on the west side; the river should be left alone.

Ms. Kiley clarified that although Mr. Field was looking for input on Alternative E, the Massachusetts Department of Environmental Protection (MA DEP) was not coming forward with a preference because there had not been a determination made as to under what authority the work would be done: CERCLA (Comprehensive Environmental Response, Compensation and Liability Act) or a wetlands perspective. She said that the MA DEP's silence should not be mistaken for approval. She added, however, that the department was willing to work with the military and the growers as far as any of the permitting aspects, in particular the agricultural exemption.

Mr. Adams remarked that the location of the river might have been different anyway, due to the bog building process. He added that moving the river would help prevent flooding in that particular section of the river.

Ms. Muramoto commented that there were good reasons for both berming the channel and realigning the river. Although she could not speak for the shellfish warden, Ms. Muramoto thought that it would be easier to maintain the channel by working on the channel close to land. She noted that there were wetlands along the side of the river and asked what impact the realignment of the channel would have on them. She added that there were many unknowns and there was no information on the stability of the bog.

Mr. McDermott noted that it was still not clear who would be responsible for the maintenance of the bog. He asked whether the federal government had the money to compensate not only the growers, but the property owners as well. **Mr. Field** summarized Mr. McDermott's concerns: compensation to growers and residents that are adversely impacted and the party responsible if something were to happen when the bogs were flooded. **Mr.**

Adams disagreed that property values were declining as a result of the EDB, although he could not say the same for his cranberry bog. He noted that town water had been supplied by the Air Force in an attempt to rectify the situation and he would prefer a solution to the problem.

Mr. Field reminded the attendees that there were differences of opinion and it was important to get those out. He concluded that the group would not be able to agree at this time on whether or not it made sense to berm or divert the channel. He mentioned there were also individuals who felt strongly that the bogs should be bought out and the growers be compensated. He stated that enough uncertainties and unknowns had been identified to necessitate more research.

Mr. Lim asked if at least half of the 3.1 acres in the East Thompson Bog would be lost with Option 2 of Alternative E. Mr. Szymoniak said yes. He also clarified that Option 2 included berming on the east side, Option 1 was the realignment. He noted that the figures were included in the matrix (see attachment #2).

Ms. Miles stated that although the group was focusing on Alternative E, she thought the other alternatives should continue to be evaluated. She noted that Alternative C was the only option that would get the entire river system to non-detect and wanted to see that option examined further. **Mr. Szymoniak** stated that continued consideration of the other alternatives was implied by the phasing of Alternative E. To clarify, Mr. Field asked whether adjustments to Alternative E could get the entire river system to non-detect. Mr., Szymoniak said yes, because Alternative E begins with the well points, which is the same as Alternative C.

Ms. Miles asked whether the purpose of Alternative E was to obtain a ten-fold decrease in concentration through the use of a holding basin, with or without shallow well points. **Mr. Szymoniak** said this was correct, but a pond would not be implemented first. There would be a pilot test initially, before realignment of the river or building a holding basin. Ms. Miles noted that in a previous meeting, Mr. Szymoniak had presented two options in Alternative C, one that included realignment and one that did not. Mr. Szymoniak stated this was correct. Ms. Miles stated that she thought Alternative C involved treatment that would capture the water at the point of upwelling, treat it and get it to non-detect, so that potentially all of the bogs could go back into production and it would have other benefits as well with the river. She thought that Alternative E did not have the same objective in that only at part of the river would the concentration decrease ten-fold, then the other bogs would be bermed off where the water could enter. She noted that the objective was only to get Pond 14 to get to non-detect. She then asked Mr. Szymoniak why there would be an increase in the treatment of the Lower Baptiste Bog.

Mr. Szymoniak replied that if the concentrations were unacceptable, it might be beneficial to increase the treatment, although it was not necessarily the preferred alternative because of the large volume to be treated. He clarified that the purpose of this alternative was not to bring the entire river system to non-detect. **Ms. Miles** noted that this was an important point, which illustrated the need to examine the pros and cons of every alternative. She mentioned Ocean Spray's concern that contaminated water would continue to flow in close proximity to the bogs. She reiterated the need to discuss Alternative C in more detail. **Mr. Field** suggested further discussion of the pros and cons of Alternative C and E. Mr. Szymoniak noted that the matrix compared the pros and cons of each alternative. He explained that the matrix included a description of the location and size of each bog, the owner of the bog, the results of inflow and outflow samples, the potential actions for each bog, and the costs of the different options. He added that a time frame for each option was also provided, excluding the permitting process.

Mr. Field asked Mr. Szymoniak to give a brief review of Options C1 and C2. **Mr. Szymoniak** explained that Option C1 relied on realigning the river. Shallow well points would be used to extract the water, pumping at approximately 1500 gpm. He noted that, at this rate, the treatment facility would need to be increased almost three-fold. He stated that this would be about 2 million gallons per day, which indicated that it was a large plume that would be treated. He added that not all of this water was contaminated.

Mr. Szymoniak went on to explain that Option C2 included the same realignment, but only targeted the mass contamination using the treatment facility at 800 gpm. The flow at EW-1 would be decreased to 400 gpm, the extra 400 gpm would treat the mass to lower the concentration. He noted that a cranberry bog and a basin would be used as back up in case of a power failure, or as an additional level of treatment that may not be achieved with only shallow well points.

Mr. Field noted that in both Option C1 and C2, the Lower Baptiste Bog would be taken out of production. Mr. Szymoniak replied that only a portion would be taken out of production, an acre would be functional. Mr. Field asked whether C1 would treat the entire river from the point of treatment, downward. Mr. Szymoniak pointed out that the water leaving the Baptiste Bog would be non-detect. Mr. Field noted that Option C1 would achieve non-detect further up the river than Alternative E. Mr. Szymoniak explained that if Option C was implemented and water was pumped at 1500 gpm, the river would go to non-detect. He added there would be no reason to take any further action downgradient at that point.

Mr. Schweisberg noted that according to the matrix Option C2 did not include river realignment. Mr. Szymoniak stated that Alternative C always included realignment, but C2 had a smaller treatment capacity. Mr. Schweisberg reiterated that the matrix stated C1 included channel realignment and C2 did not. Mr. Szymoniak said he had made a mistake and C2 would be pumping at a lower rate. Mr. Schweisberg remarked that this was an important point. Mr. Szymoniak agreed and clarified for the record that Option C2 did not include channel realignment.

Mr. Field noted that Alternative E seemed to include Option C2. Mr. Szymoniak confirmed that this was correct. **Ms. Balkus** clarified that the intent of C1 was to pump water at the rate of 1500 gpm and put up the berm and the holding basin, and realign the channel. She explained that the intent of C2 was not to realign the channel, but to use the well points and existing capacity at EW-1. She confirmed that C2 was identical to what was being proposed in Alternative E.

Mr. Szymoniak explained that C2 would not necessarily achieve non-detect, and added that he would know more once a pilot test was completed. **Ms. Kiley** noted that only Option C1 would achieve non-detect. Mr. Szymoniak stated this was correct. Ms Kiley asked whether, as with the Quashnet River, there had been consideration of using other types of treatment rather than GAC at EW-1, specifically, iron filings. Mr. Szymoniak replied that because the GAC system was already constructed and the power was there, there would be no reason not to use the proven technology. Ms. Kiley noted the capacity issue with EW-1. Mr. Szymoniak stated his belief that GAC was still the right choice.

Mr. Field stated that there were essentially three options on the table for discussion. The first option included a phased approach to Alternative E that used the existing capacity of EW-1. He noted there was still some discussion over whether the East Thompson Bog should be bermed or the channel realigned. The second option involved leaving C1 up for discussion since it provided for non-detect of more of the river than Alternative E. The third option encompassed Alternative A; the bogs would be turned into wetlands and the growers would be compensated. Mr. Field asked the group if there were any questions or clarifications.

Mr. LaFleur stated that he was concerned about detectable water coming out of the Lower Baptiste Bog. He asked if there was a way to determine if the shallow well pumping would work in order to get a better idea whether Alternative E would provide clean water. **Mr. Szymoniak** stated that there were two things that could be done. The first option would be to block Broad River and measure the concentrations at Station 14 in order to determine how to treat the water. He explained that the second option would be to do a pilot test to determine any reduction in concentration before bringing in the power. The water would be temporarily pumped to EW-1 for treatment and then measured. Mr. LaFleur noted that there was a chance that the water leaving the Lower Baptiste Bog would be non-detect. Mr. Szymoniak said this was correct.

Ms. Kiley noted that in order for any of the other alternatives to be considered further, the contingencies would need to be discussed. **Mr. Field** clarified that "contingencies" meant back-up plans should any of these alternatives not work.

Mr. Gordon stated that the criteria for marketability of the berries included one-year non-detect. He asked whether the time was currently being tracked. **Mr. Szymoniak** said the clock had been running since August of 1997. **Ms. Balkus** explained that some of the bogs were already non-detect and a large portion of the bogs south of the Lower Baptiste Bog were already separated from the river. She noted that if the shallow well point system were installed, the goal was to decrease concentrations to 0.01. She also noted that the Augusta Bog, West Thompson and Chaston bogs were already disconnected and would not need to use river water. The Lassalle and Adams Bogs would be bermed off so that they would not be using river water even though it would only be at 0.01 concentration. She said that she understood the concern of Ocean Spray representatives about the idea of perception. However, she believed

that at such a low concentration, with a lot of explanation and detail of what actions have been taken, showing that the bogs were either separated or had an alternative water source, that the issue could be addressed. She also noted the cost differential of putting in a multi-million dollar system, compared to a more practical engineered solution. She said that she still wanted feedback from the group, but wanted to provide some perspective on the level of EDB concentrations that were being discussed. She reiterated that the concentrations were very low and over a rather short reach of the river. She also noted that the bogs in question were either already separated or would be separated from the river.

Ms. Kiley asked whether steps had been taken to ensure that the Augusta Bog was no longer in contact with the river. **Mr. Szymoniak** replied that steps had been taken. Ms. Kiley asked if it was physically impossible for the bog to come in contact with the river. Mr. Szymoniak replied that it was not impossible, but that it would be much harder for the EDB to come into the bog. He added that the results of sampling up to this point indicated that the bog was non-detect, so it had not been disconnected from the river.

Ms. Muramoto asked Mr. Bicki if any marketing research was being done currently to try to help predict consumer response and, if so, how the results of the research could be accessed. **Mr. Bicki** replied that some research work was done when the issue first came up, which drove Ocean Spray away from accepting the fruit. He also noted that the communications department was pursuing market research with the future crop in mind.

Mr. McDermott stated that Ocean Spray had a tremendous need for cranberries that were not used in food, but in testing for shelf life and other things. He then asked Mr. Bicki how many barrels of cranberries Ocean Spray used for that purpose each year. **Mr. Bicki** clarified that Ocean Spray did not take in barrels of fruit for testing. He stressed that it would serve no purpose to take in contaminated fruit and contaminate the facilities with it. He also explained that the small amounts of fruit that were used internally for quality research purposes came directly from the usable fruit within the cooperative.

Mr. Bicki then addressed the issue of public perception and the marketability of the fruit. He explained that a pesticide scare in 1959 had nearly destroyed the cranberry industry, even though it had turned out that there was no pesticide issue. He also mentioned the "E. Coli" outbreak in imported raspberries two years ago. Because people thought it was associated with American strawberries, it decimated the strawberry industry. He noted that there were still people today who would not buy fresh strawberries grown in California because of the fear of contamination. He reminded the attendees of the Macks' concern that the neighborhood dogs were developing tumors thought to possibly be a result of EDB. He asked that the group keep in mind that public perception played a large part in the marketability of the fruit.

Mr. Field again summarized the three options that were on the table for discussion: Alternatives A, C1 and E. He noted the concerns that had been expressed by abutters over the flooding of the bogs, the impact on the septic systems, and who would be responsible for maintenance and emergencies. He also noted the issue of contingency plans if these alternatives did not work and the question of public perception and its impact on the fruit's marketability.

Ms. Miles asked about moving on to the next step. Ms. Balkus stated she was not ready to concede. She noted that Mr. Field had just summarized the discussion so far, but she did not feel the group was ready to determine whether or not it had reached a consensus on an alternative. Ms. Miles said she understood her concern, but knew that the US EPA would not be able to recommend an alternative that day. She stated that it seemed as though the group had narrowed the field of options and the Air Force needed to determine under what legal authority it would proceed. She explained that if the Air Force proceeded under CERCLA, it would need to prepare an action memorandum, but would skip producing an engineering evaluation cost analysis (EE/CA) document that the US EPA would evaluate. She added that the Air Force would still need to do an alternatives analysis under another authority if it did not proceed under CERCLA. She concluded that it was not realistic or appropriate to narrow the field to one alternative.

Mr. Boyer disagreed with Ms. Miles and suggested that the group develop a course of action rather than argue over whose authority would govern the actions or alternatives to be considered. He noted that the shallow well point testing would help determine an explicit course of action that could result in selecting Alternative E.

Mr. Field suggested reviewing the next steps, not as the concluding statement of the meeting, but just in case any

members of the group had questions. Ms. Kiley remarked that the next steps could help in refining any of the alternatives chosen.

Mr. Szymoniak referred back to AFCEE's preferred alternative. He noted that it included parts of everything that had been discussed: berming of the Upper Baptiste, Adams and Lassalle Bogs, shallow well points, possible realignment, providing alternate water sources and evaluation of Pond 14. He suggested that the group look at berming the Upper Baptiste, Adams and LaSalle Bogs. He emphasized that the shallow well point test program needed to be completed before moving in a power source. He reiterated that the suggestions that had been made by the group were all part of Alternative E.

Mr. Schweisberg asked if AFCEE would be unable to complete the pilot test on well point extraction if the group did not choose an alternative. Mr. Szymoniak replied that AFCEE would be able to move forward. Mr. Schweisberg stated that the group was in agreement that they needed to move in a general direction, rather than honing in on a precise alternative. He remarked that it appeared that some steps could be taken and tests be completed without an alternative being selected. He concluded that the group did not have enough information to select an alternative.

Ms. Balkus disagreed with what Mr. Szymoniak had said. She explained that if the group were to agree on Alternative A, the buyout would be implemented and there would be no reason to do the pilot test. She also noted that there was a very significant time-driver associated with the project; Congress had only given the Air Force legislative authority through the 1999 crop year, therefore, an alternative needed to be selected, designed, constructed and implemented in the 1999 time frame. It would need to be working early in the season so that during that harvest period, the surface water would be non-detect. She stated that some additional legislative authority or compensation could be pursued, but Congressmen from the other states were not supportive of this project and it would be incredibly difficult to get the funds again. She emphasized that AFCEE wanted to be extremely proactive in making sure that whatever decision was made would be implemented expeditiously. She noted her concern that the longer it took to narrow the alternatives, to come to a solution, the longer it would take to get started on design and implementation. She explained that the goal initially was to make a decision in September, engineer and design it in October, and start construction in November. Looking at what had been proposed, she said the ranges of implementation took from six months for alternative E, to nine or ten months if something as big as Alternative C was chosen, due to the additional size of the treatment plant.

Ms. Muramoto asked what criteria would be used to change course and implement Option C1 if Alternative E was in place. She also asked how quickly this change could be accomplished. **Ms. Balkus** replied that the goal of Alternative E was to reduce the concentration at the upwelling site from 0.1 to 0.01, so that by the time the water reached Pond 14, it would be non-detect. She said that it would be known within a month of the pilot test whether the 400 gpms that existed at EW-1 would be sufficient.

Mr. Field noted that the group may want to discuss the buyout option further, although he did not think there would be consensus that day. He asked whether the group thought they had narrowed the discussion to what standard they wanted to achieve at the Lower Baptiste outfall. Mr. Szymoniak felt that the group had attempted to work through that in the morning meeting. He remarked that the vines and the bog could be non-detect or there could be a ten-fold drop in the concentration that would still be detectable. Ms. Balkus commented that if the Kansas State University studies confirmed that no EDB could get into the cranberries and 0.01 concentration or less was achieved in the river system, it could have a positive impact on the marketability of the fruit.

Mr. Adams asked whether the area below Pond 14 would still be non-detect. **Mr. Szymoniak** said that was the goal. **Mr. Adams** stated that the funding did not exist for a buyout. He noted that there was only money in place for the next two years to implement either Alternative C1 or E. **Ms. Balkus** stated this was correct. **Ms. Miles** clarified that there were two types of funding involved, one to compensate the growers and the town for lost revenue, the other to cover the cost of building one of the alternatives. **Mr. Adams** said he understood that and Mr. McDermott remarked that, to his knowledge, no money had been appropriated. **Ms. Balkus** summarized that Mr. Adams was correct in that a buyout of either the crop or real estate would require an alternative to environmental funding. She stated that the funds were in place to implement any of the engineered alternatives. Mr. McDermott asked whether buying real estate was considered a form of remediation. Ms. Balkus said she would need to check with the attorneys, but for environmental clean up purposes, Defense Environmental Restoration Account (DERA)

funds were used. **Mr. Field** asked whether there was definitely compensation for 1999. **Ms. Balkus** replied there was compensation for 1998 and 1999, but not 2000.

Ms. Miles understood the concern regarding the authorization for compensation, but noted there was some urgency to reach a consensus on a single alternative with respect to these bogs. She noted that the Air Force seemed comfortable with agreeing to narrow the alternatives and move forward with regard to the Quashnet River system. She asked why there was a reluctance to do that now. She also expressed her concern as to whether there would be a document that compared alternatives that would be put out for public comment, like an EE/CA, or if the Air Force intended to deem the meeting the "public process", put out a document with one alternative, and move forward with it. **Ms. Balkus** replied that the alternatives that had been discussed at the morning meeting were very closely related and could be phased one right after the other. She noted that this was not a possibility at the present meeting because the buyout alternative was still on the table. If the group was able to narrow the selection down to engineered alternatives, but there was still a difference of opinion on the level of treatment, it would be easy to write it into the plan later.

Mr. Field noted that the second part of the question pertained to AFCEE's next step in terms of producing an EE/CA or a comparison of alternatives and allowing for public comment. **Ms. Balkus** replied that until a process determination was made, she could not specifically say what documents would or would not be produced. However, she suggested following the FS-28 EW-1 model.

Ms. Miles apologized to the other attendees for dwelling on the process. She stated that EW-1 was a time-critical removal action, but thought that what was being covered here was not time-critical. She noted that members of the public had expressed an interest in a public process if an EE/CA were done. She said she was having a problem with the fact that the process seemed to be unclear and changing at every meeting. **Ms. Balkus** remarked that she understood Ms. Miles's concern. She noted that at the Falmouth Public Meeting, it had been stated that before any alternative would be implemented, a notice of intent would be filed, allowing for public comment. She agreed that until the process question was answered definitively, she could not say whether it would be an EE/CA, an action memorandum, or if it would go through the full notice of intent and the US Army Corps of Engineers (USACE) Wetland Program. She remarked that any of those options requires public involvement and AFCEE was not trying to subvert the process. She asked that the group try to come to consensus where possible and keep moving forward to avoid losing any time.

Mr. Szymoniak suggested that if this were not a time-critical process and the action memorandum written for FS-28 was used, all of the alternatives would be included, along with cost, to derive a preferred alternative as part of that action memorandum. He noted it would not quite fit the model of the EW-1 but would have all the aspects. **Ms. Miles** said she did not even need that much. She was concerned that there was a rush to judgment without having a full process whereby alternatives could be compared and without an opportunity for the public to evaluate and comment on those alternatives. **Mr. Schweisberg** remarked that if the decision were not to go to CERCLA, the Air Force would have to go back to the Clean Water Act (CWA) and determine the range of alternatives to offer the public in terms of cost and environmental impact, both short- and long-term. He noted that the Fall Harvest Plan had backfired and thought that some lessons had been learned about proceeding too quickly and making sure certain steps were taken along the way.

Mr. Spear pointed out that Alternative E included several options, should the group be concerned about having alternatives. He explained that Alternative E accounted for varying results of the different types of treatment. He felt that the real argument was between Alternative A and Alternative E.

Mr. Handy expressed his frustration with the discussion. He stated that the group had been meeting since the previous March, trying to include all the stakeholders so everyone could express their concerns. He noted that Mr. Boyer, representing the Town of Falmouth, Mr. Gordon, representing the Falmouth Conservation Commission, and himself, as an operator of the bogs, all wanted to go ahead with the project and get something done. He stated it had been two years and it seemed as though the project was being held up by the regulators, despite the interests of the people that owned and managed the property in question.

Mr. Field interjected to summarize the progress that had been made. He reiterated his doubt that a consensus could be reached between the buyout and Alternative E. He also noted that the question of a permitting process would not

be answered at this meeting. **Mr. Costa** asked what would happen if there was no consensus in the group. **Mr. Field** said the goal was to choose and alternative that everyone could "live with." However, he noted that the regulators would have to explain what the standard process was for dealing with differences of opinion over an EE/CA or action memorandum. **Ms. Miles** explained that with the Superfund removal process, the Air Force would make the final decision after the EE/CA was produced and the public and the regulators were allowed to comment.

Ms. Miles then addressed Mr. Handy's frustration with the meeting. She said that the Air Force had not been providing the US EPA with enough information to make the alternatives work from a regulator's perspective. She explained that the US EPA was unable to choose one of the alternatives without that information. Mr. Handy questioned the purpose of the meetings if the regulators were not getting any information. Ms. Miles stated that the meetings covered technical details, but she needed answers to legal questions before she could evaluate the alternatives.

Ms. Balkus stated that she had met with Ms. Miles on several occasions outside of these meetings and was concerned that Ms. Miles had indicated that no one had met with her. Ms. Balkus noted that a meeting was scheduled the next day between Ms. Miles and Air Force lawyers to talk about this issue. Ms. Miles said she had no knowledge of that meeting.

Mr. Field interrupted to suggest that the group focus on moving forward. He asked Mr. Szymoniak and Ms. Balkus to speak about the next steps involved in achieving AFCEE's preferred alternative. **Ms. Balkus** explained that if consensus were not reached at this meeting, the decision would move to the Management Review Group (MRG). If the MRG was unable to reach a decision, the matter would go to the Executive Review Group (ERG). She noted that those meetings would be taking place within the next week. She added that today's meeting was an attempt to work with the people who were the most informed and educated on the issues and narrow the alternatives.

Mr. Szymoniak explained the next steps. The plan included some new wells that would be examined for contamination and identification of the plume's migration. He stated that a tracer test would be conducted at Pond 14 to evaluate the weir. The last step would be to prepare an action memorandum, or an EE/CA, which would outline the actions AFCEE was planning to take.

Mr. McDermott noted that although the group mentioned the buyout option, no one had expanded on the advantages of it. He noted that EDB was not the only problem in the Coonamessett River, that herbicides and pesticides from the bogs also contaminated the river. He mentioned evidence given by Mr. Hurley of the Massachusetts Division of Fisheries and Wildlife (MDFW), at the Senior Management Board (SMB) meeting. He said that the evidence outlined the impacts of the bogs including flattening the river valley, widening the river channel, and decreasing the stability and size of the river. He noted that the total cost to the Town of Falmouth for the bogs was only $87,500. He encouraged the development of a comparative study of the environmental benefit to the Town by having the bogs returned to their natural state. He recommended that any money received by the Town as damages from the Air Force due to the EDB contamination be paid as compensation to the private growers.

Mr. Field asked if any attendees had questions about the next steps. **Mr. Spear** asked the US EPA and the MA DEP about the environmental impacts of the alternatives. **Mr. Adams** asked both agencies what the delay was in considering the alternatives. **Ms. Miles** explained that the process through which the alternatives went meant a great deal. She noted that the Air Force would have the advantage of fewer, if any permits, if it were to go through the CERCLA/Superfund process. She noted that documents needed to be produced in order to determine whether the alternatives proposed would trigger other applicable laws. She added that even if the Air Force chose a non-CERCLA process, there were still a number of steps to be undertaken with evaluation and review in terms of the CWA. She concluded that since a process had not yet been chosen, it would be premature for either agency to make a determination.

Mr. Adams stated this did not answer his question in terms of the US EPA's problem with Alternative E. Ms. Miles replied she did not have a problem with that alternative, yet. However, she noted that certain questions needed to be answered by the Air Force before she could make a judgment. Mr. Adams reiterated that the subject matter had been analyzed for months. Ms. Miles stated that he was looking at it from a technical perspective, but that the US EPA had criteria defined in certain laws that must be met. Mr. Spear asked if Ms. Miles could give some examples of the information she needed. Ms. Miles explained that the Air Force needed to present an analysis

of each alternative with respect to laws applying to surface water standards. She remarked that the Air Force's delay in producing this analysis was probably due to its indecision regarding whether or not to go through the Superfund process. Mr. Spear stated that he was beginning to understand the US EPA's hesitation. He suggested making a decision on an alternative and then subjecting that alternative to all of the review necessary to determine a permit process.

Mr. Schweisberg commented that it made sense to move forward in filling some of the data gaps, rather than picking an alternative. He noted that the Air Force, in the meantime, needed to make a decision on which line of authority it would pursue. He went on to explain what the process would be if the Air Force chose to go non-CERCLA. A CWA permit and a Massachusetts Wetland Protection Act permit would be required. This would involve two more agencies in making the decision, the Conservation Commission and potentially the MA DEP, if something were appealed. The USACE, who have not been a player in any of these meetings, would become the permit decision-maker under the CWA. He noted that the USACE had a very set process for the analysis of not one alternative, but several alternatives to compare all socio-economic impacts, all environmental impacts, the costs, the long-term benefits and negatives. Mr. Schweisberg explained that if there were a need for a CWA discharge permit, there would be yet another process to go through with many similarities, but also with its particulars. He concluded that it was critical that the Air Force makes a decision regarding authority in order to determine the direction of the process and the information that would have to be obtained. He stressed that a decision on an alternative could not be made until the Air Force selected a process.

Mr. Field summarized that the work accomplished at the meeting, the narrowing of alternatives and scrutiny of next steps, would not be lost and a decision as to process would need to be made soon. He reminded the group of AFCEE's concern over time and possible compensation lost. He noted that some clarity had been achieved in terms of what the different stakeholders were thinking. He asked if there were any concluding remarks.

Mr. Taylor asked if the group could select Alternative E, subject to the approval of the regulators. Mr. Field suggested an informal vote. The majority of the attendees, including the MDFW, the Cape Cod Cranberry Growers Association (CCCGA), Ocean Spray, the Falmouth Conservation Commission, and the United States Department of Agriculture (USDA) were in favor of Alternative E, subject to the approval of the regulatory agencies. The regulatory agencies and the abutters refrained from expressing a preference at this time. One attendee indicated that he was opposed to Alternative E. Mr. Field noted that this was a straw poll.

Ms. Balkus thanked the group for their time and dedication. The meeting was adjourned at 4:25 PM.

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MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

FS-28
Coonamessett River
EDB Response Plan

Decision Meeting

21 September 1998

Presented by: Nancy Balkus/Tom Szymoniak

Bog Alternatives - Coonamessett River

- No Action
- Alternative A - EW-1 + Buy Out
  - acquire land, crop or long term lease
    - NOTE: Currently no legislative authority beyond CY99
- Alternative B - EW-1 + Channel Realignment
  - isolate upwelling and improve fish pathway
- Alternative C - EW-1 + Channel Realignment w/ Treatment
  - active treatment using shallow well points
- Alternative D - EW-1 + Separate All Bogs
  - separate entire river system
- Alternative E - Phased Approach
  - return small sections of bogs at a time via berms, alternate water source

Bog Alternatives Summary

- Upper Bogs (~26 acres)
  - Buy Out (A)
  - Separate Bogs/Alternate Water Source (B,D,E)
  - Treatment (Active or Passive) (C,E)
- Lower Bogs (~38 acres)
  - Dependent on action in upper bogs

MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

Upper Bog Response Actions

Easiest to Implement

- Upper Baptiste (E1, E2) - 2 acres
  - No action Needed
- Augusta, Chaston, West Thompson - 10 acres
  - Bogs already separated
  - Provide Alternate Water Source
- Upper Baptiste (E3), Adams, LaSalle - 4 acres
  - Bogs not separated
  - Berm and Provide Alternate Water Source

MMR
MASSACHUSETTS
MILITARY RESERVATION

Installation Restoration Program

Upper Bog Response Actions
More Complex/Difficult to Implement

- East Thompson - 3 acres
  - Bog not separated
  - Realign channel/Berm/Alternate Water Source
- Lower Baptiste - 6.6 acres
  - Treatment - Active or Passive

Preferred Alternative

- Alternative E
  - Berm Upper Baptiste, Adams, Lassalle
  - Shallow well points in Lower Baptiste
  - Realign channel in East Thompson
  - Provide alternative water source
  - Evaluate and improve weir above Pond 14 (if necessary)

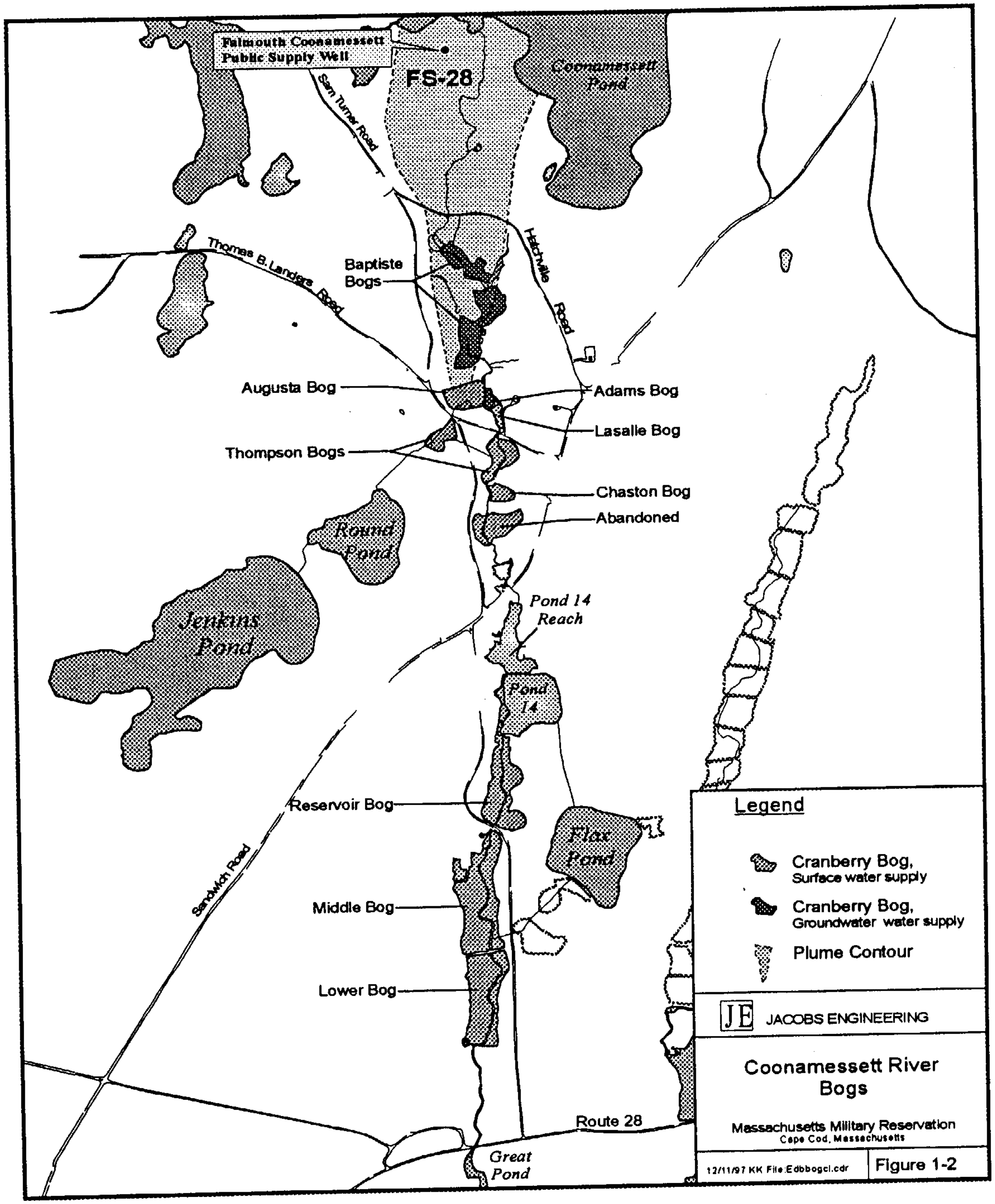
MMR MASSACHUSETTS MILITARY RESERVATION

Installation Restoration Program

Next Steps

(Dates depend on Selected Alternative)

- Fill Data Gaps
  - Submit Streamlined Work Plan (in progress)
  - Install new monitoring wells
  - Conduct Pond 14 Tracer Test
  - Evaluate weir above Pond 14
  - Continue surface water sampling
- Prepare Action Memorandum

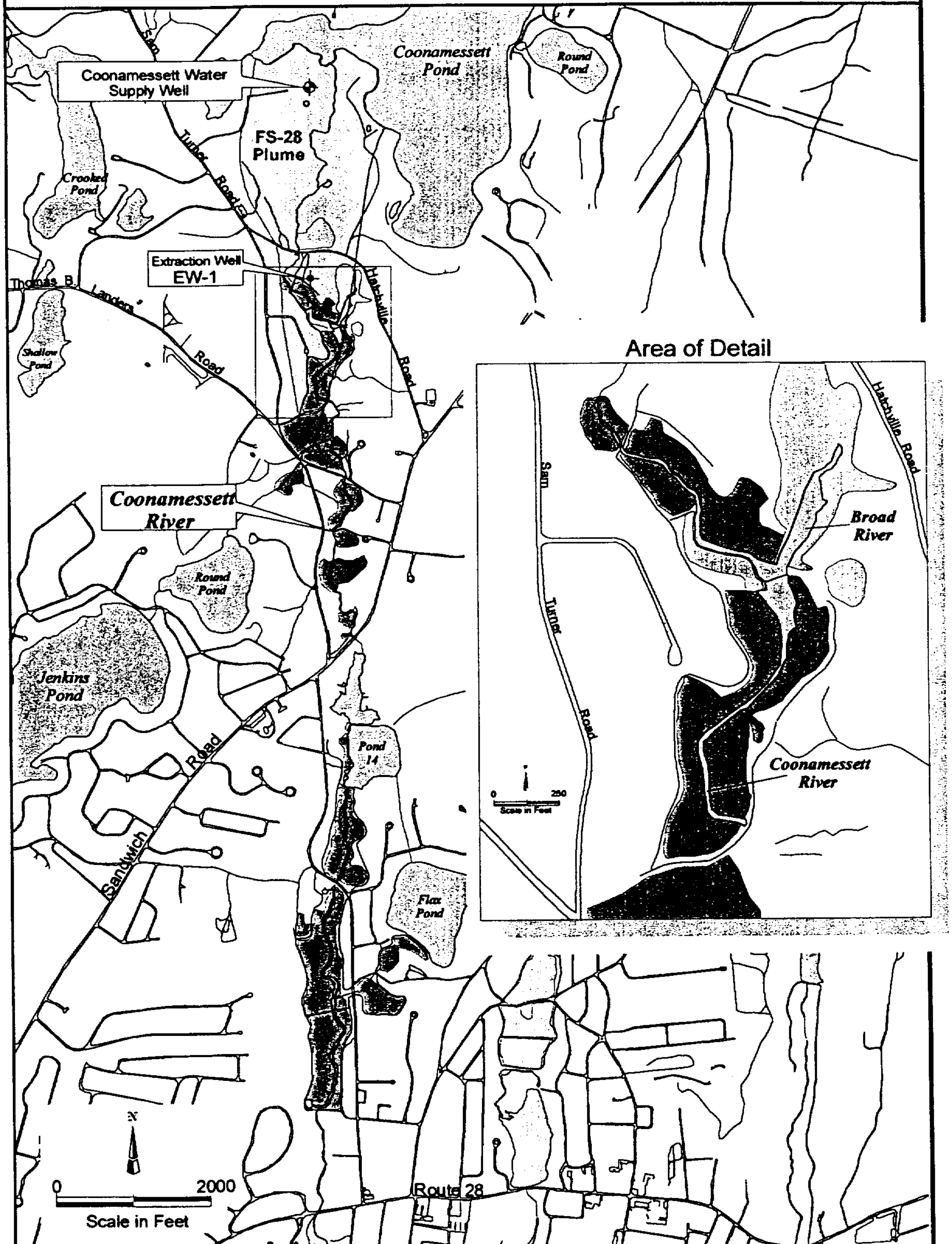

Falmouth Coonamessett
Public Supply Well
FS-28
Coonamessett Pond
Sam Turner Road
Thomas B. Landers Road
Hatchville Road
Baptiste Bogs
Augusta Bog
Adams Bog
Lasalle Bog
Thompson Bogs
Chaston Bog
Abandoned
Round Pond
Jenkins Pond
Pond 14 Reach
Pond 14
Reservoir Bog
Flax Pond
Sandwich Road
Middle Bog
Lower Bog
Route 28
Great Pond
Legend
Cranberry Bog, Surface water supply
Cranberry Bog, Groundwater water supply
Plume Contour
JE JACOBS ENGINEERING
Coonamessett River Bogs
Massachusetts Military Reservation
Cape Cod, Massachusetts
12/11/97 KK File:Edbbogcl.cdr
Figure 1-2

DRAFT

Coonamessett River Bog Alternatives
Cost Summary

Alternative	Bog Name	Cost
A - Buy Out		$4,398,000.00
B - Channel Realignment and Baptiste Holding Basin		$565,000.00
C1 - Channel Realignment, Shallow Well-Point Extraction and Treatment		$6,491,000.00
C2 - Shallow Well-Point Extraction and Treatment		$336,000.00
D - Separate All Bogs From River		$1,081,500.00
E - Phased Approaches	Upper Baptiste	$12,500.00
	E1: Lower Baptiste E2: Lower Baptiste E3: Lower Baptiste	$951,000.00 $305,000.00 $465,000.00
	Augusta	$231,000.00
	Adams	$16,000.00
	LaSalle	$18,000.00
	West Thompson	Included in Augusta
	E1: East Thompson E2: East Thompson	$95,000.00 $28,000.00
	Chaston	$3,200.00
	E1: Reservoir E2: Reservoir E3: Reservoir	$25,000.00 $75,000.00 $100,000.00
	Middle	$0.00
	Lower	$0.00
	Flax Pond	$65,000.00
	Total Range for Phased Approachs	$703,700.00 $1,491,700.00

Alternative A Buy Out



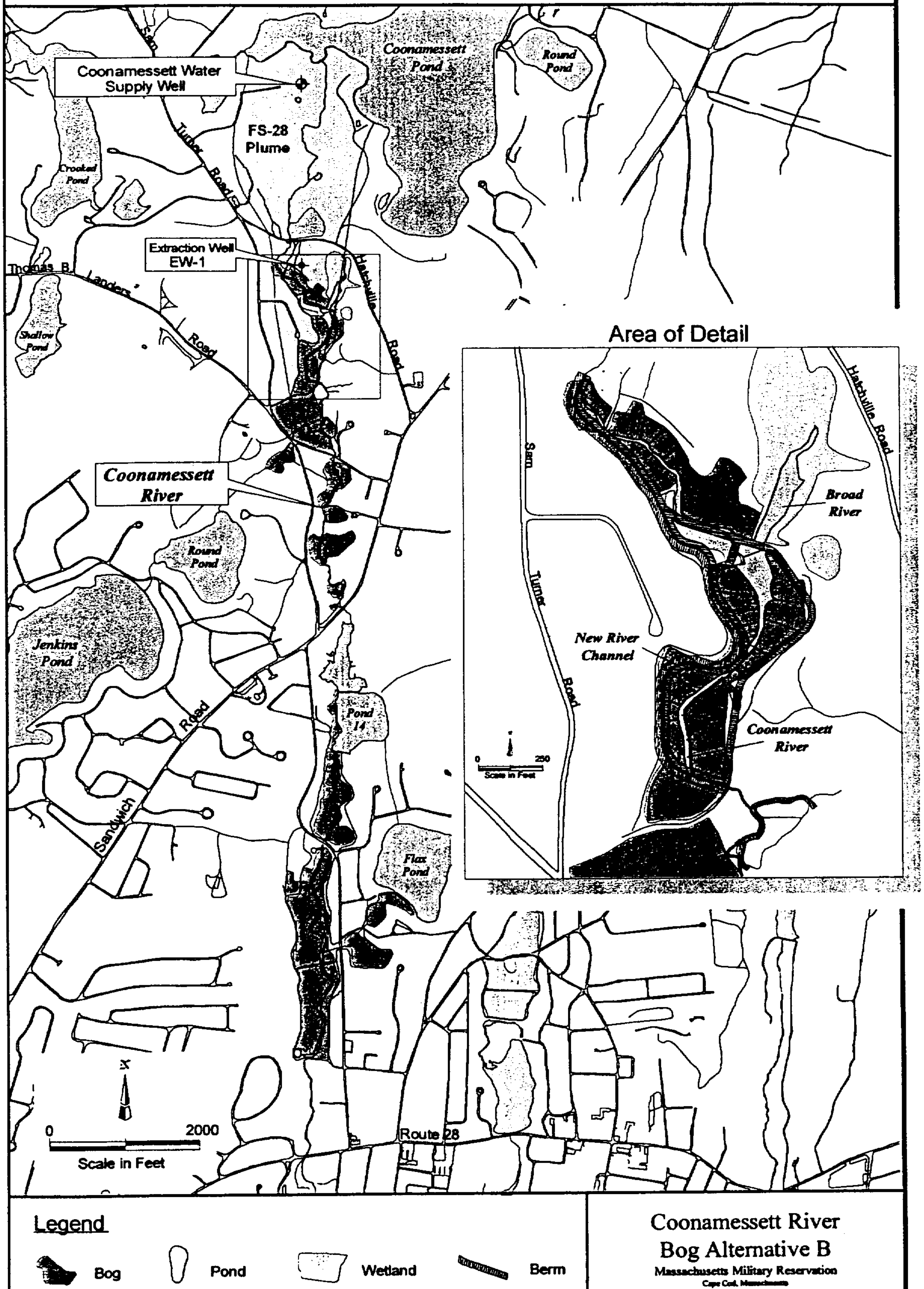
Legend

Bog Pond Wetland

Coonamessett River
Bog Alternative A
Massachusetts Military Reservation
Cape Cod, Massachusetts

Alternative B

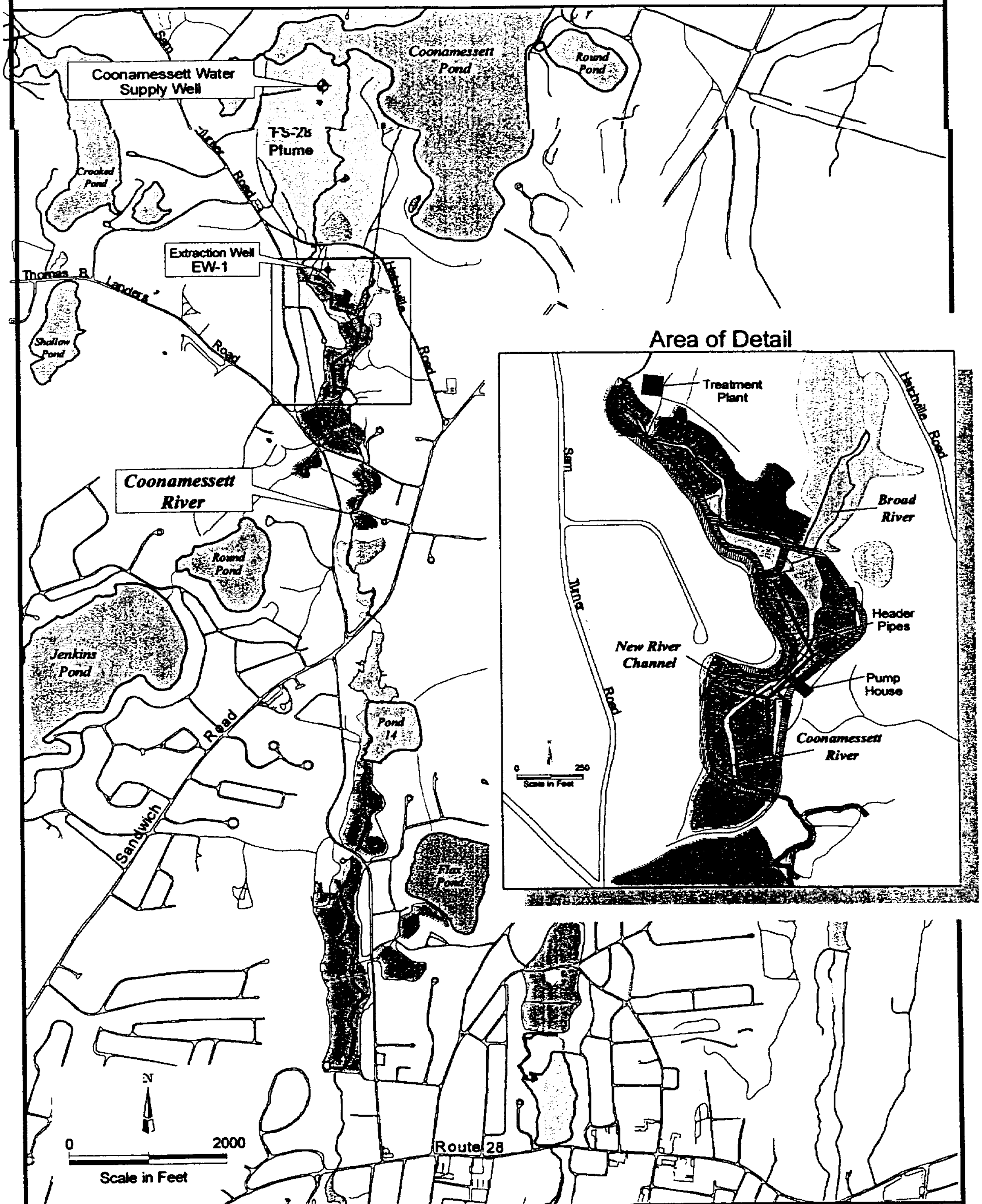
Channel Realignment
Berm Upper Bogs



Coonamessett River
Bog Alternative B
Massachusetts Military Reservation
Cape Cod, Massachusetts

Alternative C

Berm Upper Bogs, Shallow Well Point Treatment

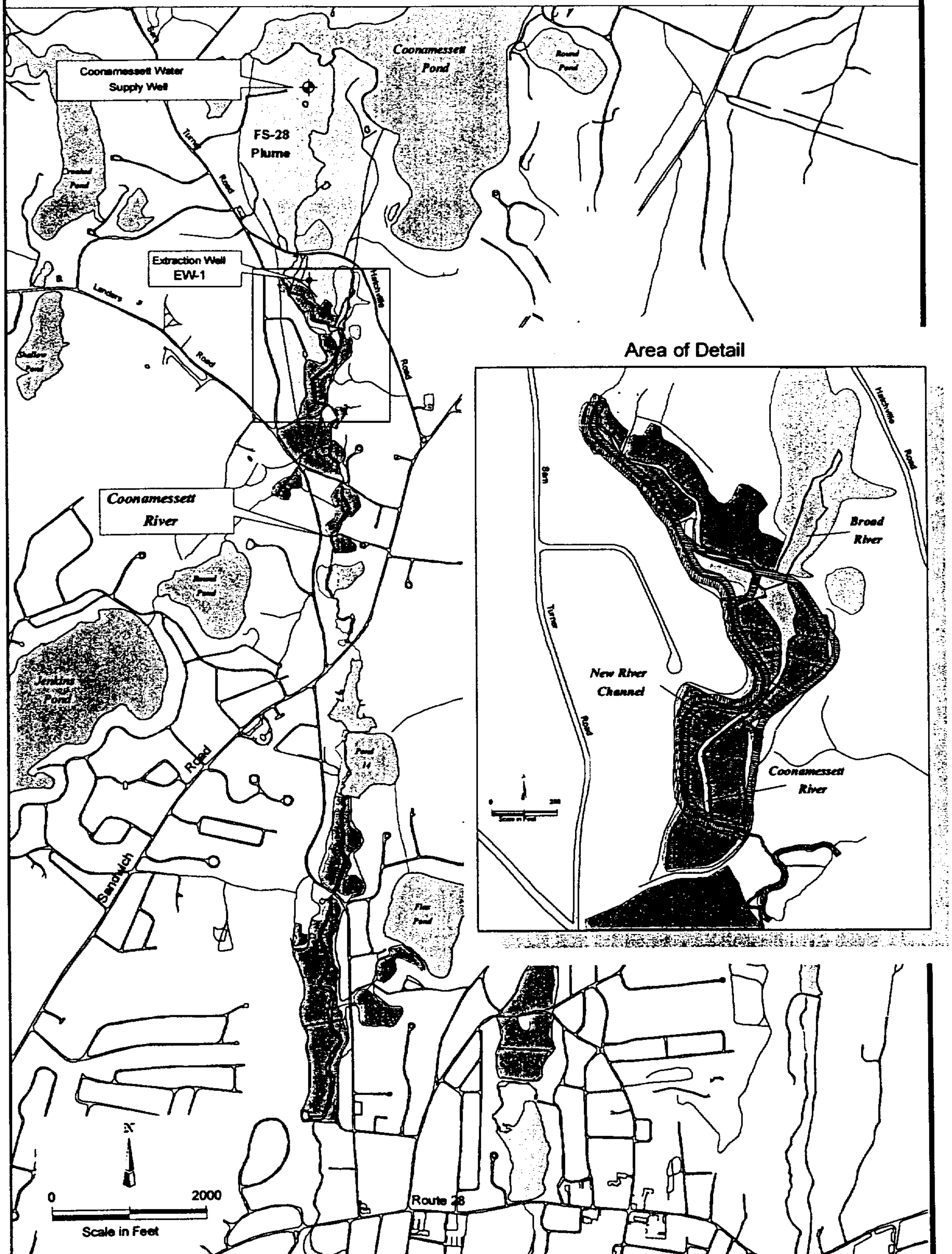


Legend

Bog — Pond — Wetland — Berm

Coonamessett River
Bog Alternative C
Massachusetts Military Reservation
Cape Cod, Massachusetts

Alternative D Separate All Bogs



Coonamessett River
Bog Alternative D
Massachusetts Military Reservation
Cape Cod, Massachusetts

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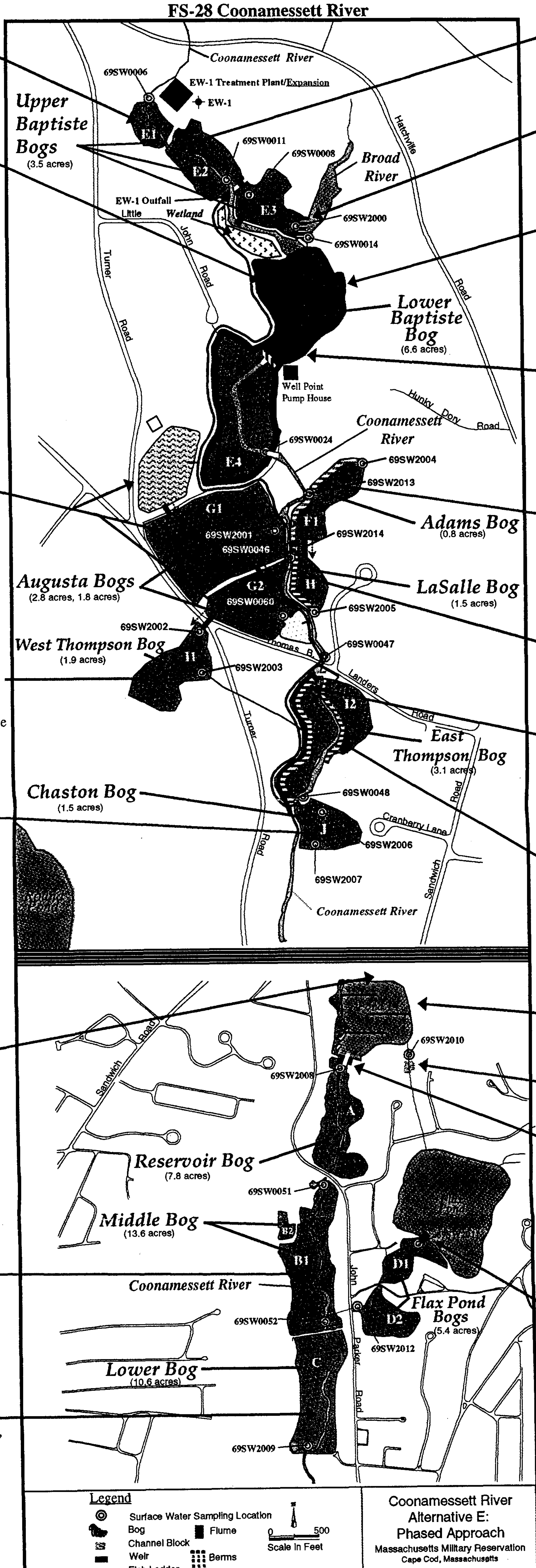
FS-28 Coonamessett River



Upper Baptiste Bog (E1)
Surface Water Data Non-Detect, Continue Collecting Surface Water Data, Berries Marketable in Fall 99

Lower Baptiste Bog (E4)
Option #1
A) Conduct **Shallow Well-Point Pilot Test** in Upper Corner of Bog, If Pilot Test Shows Can Achieve 10-fold Decrease From 0.1 to 0.01, Reduce EW-1 Pump Rate to 400 gpm, Treat Well-Point Captured Flow with Remaining Capacity of 400 gpm at EW-1 Treatment Plant, Continue Collecting Surface Water Data.

B) If Pilot Test Does Not Achieve 10-Fold Decrease Using 400 gpm, Expand Into a **Full-Scale Well-Point Extraction & Treatment System** to Capture Upwelling, Requires ~1800 gpm Expansion of the Current EW-1 Treatment Plant.

Augusta Bogs (G1 &G2)
Surface Water Data Non-Detect, Bog is Already Separated from River, Provide Alternate Water Source From EW-1 Pipeline, Develop a 1 Acre (6ft Depth) Reservoir for Water Storage, Continue Collecting Surface Water Data

West Thompson Bog (I1)
Surface Water Data Non-Detect, Bog is Already Separated from River, Provide Alternate Water Source From EW-1 Pipeline Through Augusta Bog, Continue Collecting Surface Water Data

Chaston Bog (J)
Surface Water Data Non-Detect, Bog is Already Separated from River, Provide Alternate Water Source From EW-1 Pipeline, Eliminate Water Loss From Bog, Continue Collecting Surface Water Data

Reservoir Bog (A)
Option #1
Evaluate Existing Structure at Inlet to Pond 14 as a Means of Increasing Detention Time or Decreasing Short Circuiting, Improve Fish Ladder at Pond 14 Outlet, Disconnect Pond 14 Outfall to Flax Pond, Continue Collecting Surface Water Data, Test Berries, Marketable in Fall 99

Middle Bog (B1 & B2)
Continue Collecting Surface Water Data, Test Berries, Marketable in Fall 99

Lower Bog (C)
Surface Water Data Non-Detect, Continue Collecting Surface Water Data, Test Berries, Marketable in Fall 99

Upper Baptiste Bog (E2)
Surface Water Data Non-Detect, Continue Collecting Surface Water Data, Berries Marketable in Fall 99

Upper Baptiste Bog (E3)
Berm East End of Bog E3 to Isolate From Broad River, Install 2 **New Flumes**, Continue Collecting Surface Water Data, Berries Marketable in Fall 00

Lower Baptiste Bog (E4)
Option #2
Develop **Upper Half** of the Lower Baptiste Bog into a 3 Acre (2-5 ft Depth) Holding Pond, Install a Fish Ladder at the Holding Pond Outlet to the River, Continue Collecting Surface Water Data

Lower Baptiste Bog (E4)
Option #3
Develop the **Entire** Lower Baptiste Bog into a 6 Acre (2-5ft Depth) Holding Pond, Install a Fish Ladder at Station 69SW0024, Continue Collecting Surface Water Data

Adams Bog (F1)
Berm West Side of Bog to Separate it from the River, Provide Alternate Water Source From EW-1 Pipeline, Continue Collecting Surface Water Data

LaSalle Bog (H)
Berm West Side of Bog to Separate it from the River, Improve Choked Channel, Provide Alternate Water Source From EW-1 Pipeline, Continue Collecting Surface Water Data

East Thompson Bog (I2)
Option #1
Realign Channel to West Side, Install a Weir at the End of the Bog, Provide Alternate Water Source From EW-1 Pipeline, Continue Collecting Surface Water Data

East Thompson Bog (I2)
Option #2
Berm East Side of River Channel, West Side Becomes Wetlands, East Side Remains Cranberry Bog, Provide Alternate Water Source From EW-1 Pipeline, Continue Collecting Surface Water Data

Reservoir Bog (A)
Option #2
Install Floating Baffles Across Pond 14 (or plants) to Increase Detention Time and to Decrease Short Circuiting, Disconnect Pond 14 Outfall to Flax Pond, Continue Collecting Surface Water Data, Test Berries, Marketable in Fall 99

Reservoir Bog (A)
Option #3
Improve the Weir at Pond 14 outfall to Raise Elevation ~Half Foot, Improve the Fish Ladder at Pond 14 Outlet, Disconnect Pond 14 Outfall to Flax Pond, Continue Collecting Surface Water Data, Test Berries, Marketable in Fall 99

Flax Pond Bogs (D1 & D2)
Improve Flume at Flax Pond Outlet for Fish Migration, Continue Collecting Surface Water Data, Test Berries, Market FY98

14-Sep-98

(8)

FALMOUTH CONSERVATION COMMISSION LETTER DATED 21 SEPTEMBER 1998

Falmouth Conservation Commission

59 TOWN HALL SQUARE, FALMOUTH, MASSACHUSETTS 02540
(508) 548-7611 - EXT. 255 • FAX (508) 457-2511

Monday, September 21, 1998

Ms. Nancy Balkus
AFCEE
Otis Air National Guard Base, MA 02542

Dear Ms. Balkus,

The Falmouth Conservation Commission held a public meeting on September 16, 1998 to discuss AFCEE's proposed options for remediation of EDB contamination in the Coonamessett River. We commend AFCEE and Jacobs Engineering for the thorough investigations that have been conducted to date and for the effort made to present this complex information in a comprehensible manner.

The Falmouth Conservation Commission voted to endorse the <u>process</u> that has resulted in Alternative E. This alternative has evolved from continuing discussion and from the inclusion of new information as it has become available. We endorse the continuance of this process and expect to actively participate in future discussions and decisions.

Alternative E includes several elements which are of interest to the Commission. Some of these elements were outlined in our recommendations to the Falmouth Board of Selectmen in January (enclosed). There are also additional elements which the Commission wishes to add to Alternative E. These elements of interest include:

1) Continue operation of extraction well EW-1 to treat the EDB plume for as long as necessary. Continue to monitor and model the effectiveness of EW-1.

2) "Treat" (in some manner yet to be decided) the remnant plume that has bypassed EW-1. Treatment probably includes the creation of a pond at the lower Baptiste Bog site (either 3 or 6 acres). In general, the Commission would prefer "passive" treatment where feasible, staging up to a more complex "engineering" solution (e.g. Alternative C) at a later time as proven necessary.

3) Growers have been damaged by past actions taken at the MMR and should be compensated for this damage. The MMR should continue to provide compensation for crop loss to all growers (public and private) until the bogs can produce a saleable crop. Please note that purchase of <u>land</u> by a Federal agency is probably not a viable alternative in Falmouth; this was not explicitly discussed on Sept. 16.

4) Separate the existing cranberry bogs from the Coonamessett

River by constructing a series of berms along the full length of the river. This action will not only separate the cranberry bog from possible contamination by EDB but will also create a system that will allow improved water control by the growers. The berm system should provide a built-in capacity for water retention by the grower following application of fertilizers, pesticides, and other chemicals to the bogs. Two long-term goals of the Commission are to recreate a more natural stream and to physically separate the stream from agricultural chemicals. In recommending this element, the Commission recognizes and accepts that some operational bog acreage may be lost. It is important to design the berm buffer strip system to ensure an adequate water supply so that cranberry bog operations do not adversely affect the natural stream flow at critical times such as anadromous fish migrations. We further recommend that AFCEE retain additional expertise (wildlife biology,. wetlands specialist) for advice in the design, construction and planting of the berm buffer strips.

5) This work must receive appropriate regulatory scrutiny and public comment at all relevant levels. The Conservation Commission will work with AFCEE to help facilitate this process but recognizes that adequate review will require both time and effort for all involved.

6) Adequate cost estimates are necessary for informed decision-making. We recommend that these be generated when individual tasks are more precisely defined. Such cost estimates should not only consider capital and maintenance costs of remedial actions but also benefits (societal, historic, recreational, economic, "sense-of-place") of cranberry bogs and open space in Falmouth.

The Falmouth Conservation Commission will be actively involved in future discussions and decisions and will work with all concerned parties to craft an effective and satisfactory solution to this problem.

Sincerely,

David Potter

David Potter
Chairman, Falmouth Conservation Commission

Allan G. Gordon

Allan Gordon
Vice-Chairman, Falmouth Conservation Commission and Chairman, Bog Subcommittee

cc/ Board of Selectmen
Board of Health
B. Handy
J. Lafleur

(9)

HOUSE OF REPRESENTATIVES BILL 3579, EMERGENCY SUPPLEMENTAL APPROPRIATIONS ACT FOR FY98

From HR 3579, Emergency Supplemental Appropriations Act for FY 98 (as sent to the President circa 1 May 1998):

SEC. 10. (a)(1) The Secretary of Defense may enter into a lease or acquire any other interest in the parcels of land described in paragraph (2). The parcels consist in aggregate of approximately 90 acres.

(2) The parcels of land referred to in paragraph (1) are the following land used for the commercial production of cranberries:

(A) The parcels known as the Mashpee bogs, located on the Quashnet River adjacent to the Massachusetts Military Reservation, Massachusetts.

(B) The parcels known as the Falmouth bogs, located on the Coonamessett River adjacent to the Massachusetts Military Reservation, Massachusetts.

(3) The term of any lease or other interest acquired under paragraph (1) may not exceed two years.

(4) Any lease or other real property interest acquired under paragraph (1) shall be subject to such other terms and conditions as are agreed upon jointly by the Secretary and the person or entity entering into the lease or extending the interest.

(b) Of the amounts appropriated or otherwise made available for the Department of Defense for fiscal year 1998, up to $2,000,000 may be available to acquire interest under subsection (a).

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APPENDIX B

ENVIRONMENTAL ASSESSMENT FORMS

LETTER OF TRANSMITTAL

DATE:	February 6, 1998
TO:	Lauren Foster
	Jacobs Engineering
	318 East Inner Road
	OTIS ANGB, MA 02542
SUBJECT:	**Massachusetts Military Reservation**
FROM:	Bob Erickson
JOB NO.:	

X For Your Information x For Your Review
___ For Your Use x For Your Comment
___ Per Your Request

REMARKS:

Attached is the vegetation transect summary descriptions and field data forms that were completed in August 1997. The field data forms are MA DEP wetland delineation forms which were useful in displaying the transect plot data.

Call me if you have any questions.

Bob Erickson
(978) 371-4246

EARTH TECH
450 Bedford Street
Lexington, MA 02173
(508)-371-4000
FAX: (781)-863-2906

20780/esp/tjacobs2

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Transect one
plot one.
8·14·97

ATTACHMENT III
DEP BORDERING VEGETATED WETLAND (310 CMR 10.55) DELINEATION FIELD DATA FORM

Applicant: ______ Prepared by: Schall+Berntsen Project location: Hatchville Road Falmouth, MA. DEP File #: ______

Check all that apply:

- ☐ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☒ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information)

Section I. Vegetation Observation Plot Number: One Transect Number: one (plot size 15' x 30') Date of Delineation: 8·14·97

A. Sample Layer and Plant Species	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
Trees:				
Red maple (Acer rubrum)	23/23	100%	YES	FAC
Saplings:				
Red maple (Acer rubrum)	16-25% (20.5)	87%	YES	FAC
Shrubs:				
Bebb willow (Salix bebbiana)	26-50% (38.0)	37%	YES	FACW
Fetterbush (Leucothoe racemosa)	16-25% (20.5)	20%	YES	FACW
Vines:				
Poison ivy (Toxicodendron radicans)	26-50% (38.0)	78%	YES	FAC
Virginia creeper (Parthenocissus quinquefolia)	6-15% (10.5)	22%	YES	FACU

* Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c. 131, s.40); plants in the genus Sphagnum; plants listed as FAC, FAC+, FACW-, FACW, FACW_ or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

Herbaceous: sphagnum moss is dominant. YES. OBL.
(refer to attached sheet for trans. one. plot one).

Vegetation conclusion:
Number of dominant wetland indicator plants: 6 Number of dominant non-wetland indicator plants: 1

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? Yes No

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent.

Hatchville Plot One-(Herbaceous)
8.14.97

ATTACHMENT II
HERBACEOUS VEGETATION SURVEY DATA SHEET

Date: 8.14.97 Site: Hatchville Road Field Crew: Schall + Berntsen Transect Coordinates (beginning): N ° ' " W ° ' "

Transect Number: One Plot One 15' x 30' Habitat Type: Scrub-shrub wetland on abandoned bog. Transect Coordinates (end): N ° ' " W ° ' "

Species	% Cover Plot 1	% Cover Plot 2	% Cover Plot 3	% Cover Plot 4	% Cover Plot 5	Comments
Overall Plot Cover	100%	80%	90%	30%	80%	
Sphagnum moss	96-100% (98.0)	51-75% (63.0)	76-95% (85.5)	16-25% (20.5)	76-95% (85.5)	
Marsh fern	6-15% (10.5)	1-5% (3.0)	6-15% (10.5)	1-5% (3.0)	1-5% (3.0)	
Leatherleaf	1-5% (3.0)	1-5% (3.0)				
Poison ivy	6-15% (10.5)	16-25% (20.5)	1-5% (3.0)	1-5% (3.0)	1-5% (3.0)	
Fetterbush	1-5% (3.0)					
Bluejoint grass	Trace		trace			
Red maple			trace		Trace	
Sensitive fern			6-15% (10.5)	Trace	Trace	
Sweet pepperbush					1-5% (3.0)	
Virginia creeper					1-5% (3.0)	
Leaf litter/bare ground		16-25% (20.5)	1-5% (3.0)	51-75% (63.0)	16-25% (20.5)	

% Cover to nearest 20 % by species. Include % bare ground. For species occupying less than 20% plot use less-than symbol (<).

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? Yes No

Title/date: Soil Survey of Barnstable Co, MA 1993.

Map number: 31

Soil type mapped: Freetown coarse sand

Hydric Soil Inclusions: Ft - Freetown coarse sand

Are field observations consistent with soil survey? Yes No

Remarks: Abandoned cranberry bog with scrub-shrub vegetation.

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
Oi	0-2"	5YR 2.5,2 Dark reddish brown	
Oe	2-8"	5YR 2.5,2 " "	
Ap	8-12"	10YR 2,2 (very dark brown, medium-coarse sand	
Bh	12"-14"	10YR 4,3 Brown coarse sand	
B1	14-18"	2.5Y 4,2, Dark grayish brown coarse sand, 5% gravel.	

Remarks:

3. Other

Conclusion: Is soil hydric? Yes No

Other Indicators of Hydrology: (check all that apply and describe)

- ☒ Site inundated: seasonal ponding in depressions
- ☒ Depth to free water in observation hole: 6"
- ☒ Depth to soil saturation in observation hole: saturated to surface
- ☐ Water marks: not observed
- ☐ Drift lines: not observed
- ☐ Sediment deposits: not observed
- ☐ Drainage patterns in BVW: not observed
- ☐ Oxidized rhizospheres: not observed
- ☒ Water-stained leaves: observed in shallow depressions
- ☒ Recorded data (stream, lake, or tidal gauge; aerial photo; other): Aerial photo
- ☐ Other:

Vegetation and Hydrology Conclusion

	Yes	No
Number of wetland indicator plants ≥ number of non-wetland indicator plants	☒	☐
Wetland hydrology present:		
Hydric soil present	☒	☐
Other indicators of hydrology	☒	☐
Present	☐	☐
Sample location is in a BVW	☒	☐

Transect One
Plot. Two. (30' r)
8.14.97.

ATTACHMENT III
DEP BORDERING VEGETATED WETLAND (310 CMR 10.55) DELINEATION FIELD DATA FORM

Applicant: ______ Prepared by: Schall + Bontsen Project location: Hatchville Road Falmouth, MA. DEP File #: ______

Check all that apply:

☐ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
☒ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
☐ Method other than dominance test used (attach additional information)

Section I. Vegetation Observation Plot Number: Two Transect Number: One. (30' radius) Date of Delineation: 8.14.97

A. Sample Layer and Plant Species	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
Trees. Absent				
Saplings: Trace red maple				
Shrubs:				
Leatherleaf (Chamaedaphne calyculata)	51-75% (63.0)	66%	YES	OBL.
Herbaceous (5' radius)				
marsh fern (T. palustris)	6-15% (10.5)	20%	YES	FACW
sphagnum moss.	26-50% (38.0)	74%	YES	OBL.

* Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c. 131, s.40); plants in the genus Sphagnum; plant listed as FAC, FAC+, FACW-, FACW, FACW_ or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicato plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

Vegetation conclusion:
Number of dominant wetland indicator plants: 3 Number of dominant non-wetland indicator plants: 0

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? Yes No
If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent.

Plot is located within interior of an abandoned bog with a wet scrub plant community.

4. Sheet-1
8·14·97

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? Yes No

Title/date: Soil Survey of Barnstable County, MA. 1993

Map number: 31

Soil type mapped: Freetown coarse sand

Hydric Soil Inclusions: Ft - Freetown coarse sand

Are field observations consistent with soil survey? Yes No

Remarks: Abandoned bog with emergent + shrub-scrub vegetation

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
O_i	0-5"	7.5 YR 3,3 (dark brown)	
Ap	5-9"	10 YR 3,1 (very dark gray)	
B_1	9-16"	10 YR 4,2 (dark grayish brown)	
B_2	16"	2.5 Y 2.5,1 (black)	

Remarks:

3. Other

Conclusion: Is soil hydric? Yes No

Other Indicators of Hydrology: (check all that apply and describe)

- ☐ Site inundated: not observed
- ☑ Depth to free water in observation hole: 3"
- ☑ Depth to soil saturation in observation hole: saturated at surface
- ☐ Water marks: not observed
- ☐ Drift lines: not observed
- ☐ Sediment deposits: not observed
- ☐ Drainage patterns in BVW: not observed
- ☐ Oxidized rhizospheres: not observed
- ☑ Water-stained leaves:
- ☑ Recorded data (stream, lake, or tidal gauge; aerial photo; other): aerial photo
- ☐ Other:

Vegetation and Hydrology Conclusion

	Yes	No
Number of wetland indicator plants ≥ number of non-wetland indicator plants	☑	☐
Wetland hydrology present:		
Hydric soil present	☑	☐
Other indicators of hydrology	☑	☐
Present	☐	☐
Sample location is in a BVW	☑	☐

8.14.97

ATTACHMENT III
DEP BORDERING VEGETATED WETLAND (310 CMR 10.55) DELINEATION FIELD DATA FORM

Applicant: JEG Prepared by: Schall + Bentsch Project location: Hatchville Road Falmouth, MA. DEP File #: ______

Check all that apply:

- ☐ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☒ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information) plot size (15' x 30')

Section I. Vegetation Observation Plot Number: three Transect Number: One Date of Delineation: 8.14.97

A. Sample Layer and Plant Species	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
trees				
red maple (Acer rubrum)	141/246	57%	Yes	FAC
Bebb willow (Salix bebbiana)	105/246	43%	YES	FACW
saplings.				
red maple (Acer rubrum)	6-15% (10.5)	100%	Yes	FAC
shrubs:				
sweet pepperbush (clethra alnifolia)	26-50% (38.0)	45%	Yes	FAC+
Arrowwood (Viburnum dentatum)	16-25% (20.5)	24%	Yes	FAC
speckled alder (Alnus rugosa)	16-25% (20.5)	24%	Yes	FACW

* Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c. 131, s.40); plants in the genus Sphagnum; plan[ts] listed as FAC, FAC+, FACW-, FACW, FACW_ or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicat[or] plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

vines: trace wild grape.
herbaceous: refer to attached sheet. sweet pepperbush seedling occur. Yes. FAC+

Vegetation conclusion:
Number of dominant wetland indicator plants: 7 Number of dominant non-wetland indicator plants: 0

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? Yes No

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent.

Plot three (herbaceous)
8·14·97

ATTACHMENT II
HERBACEOUS VEGETATION SURVEY DATA SHEET

Date: 8·14·97 Site: Hatchville Road Field Crew: Schall + Berntsen Transect Coordinates (beginning): N ° ' " W ° ' "

Transect Number: One Plot-Three 15' x 30' Habitat Type: Scrub-Shrub wetland adjacent to Coonamessett River. Transect Coordinates (end): N ° ' " W ° ' "

Species	% Cover Plot 1	% Cover Plot 2	% Cover Plot 3	% Cover Plot 4	% Cover Plot 5	Comments
Overall Plot Cover	20%	10%	3%	—	10%	* sparse
sweet pepperbush	16-25% (20.5)	6-15% (10.5)	1-5% (3.0)	Trace	Trace	herbaceous
marsh fern	Trace				Trace	ground cover.
Dewberry					Trace	evidence of
wood fern					6-15% (10.5)	water scour
Cinnamon fern					1-5% (3.0)	from river.
Red maple					Trace	
leaf litter/Bare ground	96-100% (98.0)	96-100% (98.0)	96-100% (98.0)	96-100% (98.0)	96-100% (98.0)	

% Cover to nearest 20 % by species. Include % bare ground. For species occupying less than 20% plot use less-than symbol (<).

8·19·97

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? Yes No

Title/date: Soil Survey of Barnstable County, MA. 1993

Map number: 31

Soil type mapped: Berryland mucky loamy coarse sand

Hydric Soil inclusions: BmA - Berryland mucky loamy coarse sand

Are field observations consistent with soil survey? Yes No

Remarks: wetland is located in floodplain and subject to seasonal inundation

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
Oe	0-1½"	2.5YR 3,6 (dark red)	
Oe₂	1½-4"	2.5YR 2.5,1 (reddish black)	
Ap	4-10"	10YR 4,2 (dark grayish brown)	
Bh	10-16"	5YR 2.5,1 (black)	

Remarks:

3. Other

Conclusion: Is soil hydric? Yes No

Other Indicators of Hydrology: (check all that apply and describe)

- ☐ Site inundated: not observed
- ☐ Depth to free water in observation hole: not observed
- ☑ Depth to soil saturation in observation hole: 9"
- ☐ Water marks: not observed
- ☐ Drift lines: not observed
- ☐ Sediment deposits: not observed
- ☐ Drainage patterns in BVW: not observed
- ☐ Oxidized rhizospheres: not observed
- ☑ Water-stained leaves:
- ☑ Recorded data (stream, lake, or tidal gauge; aerial photo; other): aerial photo
- ☑ Other: evidence of scour by adjacent stream

Vegetation and Hydrology Conclusion

	Yes	No
Number of wetland indicator plants ≥ number of non-wetland indicator plants	☑	☐
Wetland hydrology present:		
Hydric soil present	☑	☐
Other indicators of hydrology	☑	☐
Present	☐	☐
Sample location is in a BVW	☑	☐

ATTACHMENT III
DEP BORDERING VEGETATED WETLAND (310 CMR 10.55) DELINEATION FIELD DATA FORM

Applicant: JEG Prepared by: Schell & BennTsen Project location: Hatchville Road Falmouth, MA. DEP File #: ______

Check all that apply:

- ☐ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☐ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information)

Plot size: 15' x 30'

Section I. Vegetation Observation Plot Number: One Transect Number: Two Date of Delineation: 8.22.97

A. Sample Layer and Plant Species	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
Trees: absent				
Saplings: absent				
* Shrubs: swamp azalea (R. viscosum)	16-25% (20.5)	18%	YES	OBL
sweet pepperbush (C. alnifolia)	26-50% (38.0)	33%	YES	FAC+
Arrowwood (V. dentatum)	16-25% (21.5)	18%	YES	FAC
Vines: poison ivy (T. radicans)	6-15% (10.5)	100%	YES	FAC

* Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c. 131, s.40); plants in the genus Sphagnum; plants listed as FAC, FAC+, FACW-, FACW, FACW_ or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

Herbs: see attached worksheet. Common species include: sweet pepperbush (FAC+), sensitive fern (FACW), and cinnamon fern (FACW).

Vegetation conclusion:
Number of dominant wetland indicator plants: 7 Number of dominant non-wetland indicator plants: 0

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? Yes No

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent.

* Associated shrub layer species include: HB blueberry, speckled alder, multiflora rose, and fetterbush.

HM 111.1
8.22.97
Transect 2

ATTACHMENT II
HERBACEOUS VEGETATION SURVEY DATA SHEET

Date: 8.22.97 Site: Hatchville Road Field Crew: Schub + Beuntsen Transect Coordinates (beginning): N ° ' " W ° ' "

Transect Number: TWO Habitat Type: Scrub wetland on Border of Forested wetland. Transect Coordinates (end): N ° ' " W ° ' "

Plot No. 1. (15' x 30') (1m²)

Species	% Cover Plot 1	% Cover Plot 2	% Cover Plot 3	% Cover Plot 4	% Cover Plot 5	Comments
Overall Plot Cover						
Canada mayflower	6-15%	6-15%	1-5%			
sweet pepperbush	6-15%	6-15%	1-5%			
red maple	trace			trace	trace	
Cinnamon fern		26-50%				
red cedar		trace				
Swamp azalea		trace				
marsh fern			6-15%	1-5%	1-5%	
Poison ivy			1-5%		trace	
Arrowwood			1-5%	1-5%	6-15%	
Sensitive fern			trace	6-15%	6-15%	
swamp candles				1-5%	1-5%	
Violet spp.					trace	
leaf litter	96-100%	96-100%	96-100%	76-95%	76-95%	

% Cover to nearest 20 % by species. Include % bare ground. For species occupying less than 20% plot use less-than symbol (<).

8-22-97
transect 2

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? Yes No (Yes circled)

Title/date: Soil Survey of Barnstable Co, MA. 1993

Map number: 31

Soil type mapped: Freetown mucky peat (Fm)

Hydric Soil Inclusions: Fm and Ft = Freetown coarse sand

Are field observations consistent with soil survey? Yes No (Yes circled)

Remarks: scrub wetland adjacent to forested wetland soil profile altered due to agricultural (past) practices.

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
Oe	0-3"	5YR 2.5/1 to 5YR 2.5/2. black to dark reddish brown organic	
Ap	3-12"	5YR 4/2, dark reddish gray coarse sand, 5YR 3/1 very dark gray mottles, oxidized rhizospheres, sl gravel	
B	12-18"	7.5YR 2.5/1 Black loamy sand, Free water at 16"	

Remarks:

3. Other

Conclusion: Is soil hydric? Yes No (Yes circled)

Other Indicators of Hydrology: (check all that apply and describe)

- ☐ Site Inundated: NOT OBSERVED
- ☒ Depth to free water in observation hole: 16"
- ☒ Depth to soil saturation in observation hole: 12"
- ☐ Water marks: not observed
- ☐ Drift lines: not observed
- ☐ Sediment deposits: not observed
- ☐ Drainage patterns in BVW: not observed in plot.
- ☒ Oxidized rhizospheres: OBSERVED @ 3-12"
- ☒ Water-stained leaves: OBSERVED
- ☒ Recorded data (stream, lake, or tidal gauge; aerial photo; other): Aerial photo
- ☐ Other:

Vegetation and Hydrology Conclusion

	Yes	No
Number of wetland indicator plants ≥ number of non-wetland indicator plants	☒	☐
Wetland hydrology present:		
Hydric soil present	☒	☐
Other indicators of hydrology	☒	☐
Present	☐	☐
Sample location is in a BVW	☒	☐

8.22.97

ATTACHMENT III
DEP BORDERING VEGETATED WETLAND (310 CMR 10.55) DELINEATION FIELD DATA FORM

Applicant: JEG Prepared by: Schall + Borntsen Project location: Hatchville Road Falmouth, MA. DEP File #: ______

Check all that apply:

(Plot size 30' radius)

- ☐ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☐ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information)

Section I. Vegetation Observation Plot Number: TWO Transect Number: TWO Date of Delineation: 8.22.97

A. Sample Layer and Plant Species	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
Trees: red maple (Acer rubrum)				
Pitch pine (Pinus rigida)	425/1237	34%	YES	FAC
Saplings: red maple (Acer rubrum)	812/1237	66%	YES	FACU
Vines: wildgrape (Vitis labrusca)	16-25% (20.5)	100%	YES	FAC
catbrier (Smilax rotundifolia)	1-5% (3.0)	22%	YES	FACU
	6-15% (10.5)	78%	YES	FAC
* Shrubs: swamp azalea (R. viscosum)	16-25% (20.5)	20%	YES	OBL
multiflora rose (R. multiflora)	26-50% (38.0)	38%	YES	FACU
Black alder (Ilex verticillata)	16-25% (20.5)	20%	YES	FACW
Herbaceous: marsh fern (T. palustris)	6-15% (10.5)	28%	YES	FACW
sweet pepperbush (C. alnifolia)	16-25% (20.5)	55%	YES	FAC+

• Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c. 131, s.40); plants in the genus Sphagnum; plants listed as FAC, FAC+, FACW-, FACW, FACW+ or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

Vegetation conclusion:
Number of dominant wetland indicator plants: 7 Number of dominant non-wetland indicator plants: 3

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? Yes No

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent.

* associated shrub species include: sweet pepperbush and fetterbush.

8.22.97

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? Yes No

Title/date: soil survey of Barnstable Co, MA. 1993

Map number: 31

Soil type mapped: Freetown muck (Fm)

Hydric Soil inclusions: Fm; Ft. Freetown coarse sand

Are field observations consistent with soil survey? Yes No

Remarks: soil profile altered due to past Agric practices. Forested wetland on abandoned cranberry bog.

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
Oe	0-4"	5YR 2.5,1 black	
Ap	4-13"	10YR3,2 very dark grayish brown coarse sand, saturated, free water at 8".	
B	13"-16"	10YR3,1 fine sand and silt material.	

Remarks:

3. Other

Conclusion: Is soil hydric? Yes No

Other Indicators of Hydrology: (check all that apply and describe)

- ☐ Site inundated: not observed
- ☒ Depth to free water in observation hole: 8"
- ☐ Depth to soil saturation in observation hole: saturated to 4"
- ☐ Water marks: not observed
- ☐ Drift lines: not observed
- ☐ Sediment deposits: not observed
- ☒ Drainage patterns in BVW: Abandoned drainage dikes
- ☐ Oxidized rhizospheres: not observed
- ☒ Water-stained leaves: observed in low areas
- ☒ Recorded data (stream, lake, or tidal gauge; aerial photo; other): aerial photo.
- ☐ Other:

Vegetation and Hydrology Conclusion

	Yes	No
Number of wetland indicator plants ≥ number of non-wetland indicator plants	☒	☐
Wetland hydrology present:		
Hydric soil present	☒	☐
Other indicators of hydrology	☒	☐
Present	☐	☐
Sample location is in a BVW	☒	☐

Plot no. 3
8·28·97

ATTACHMENT III
DEP BORDERING VEGETATED WETLAND (310 CMR 10.55) DELINEATION FIELD DATA FORM

Applicant: JEG Prepared by: Schell + Bantien Project location: Hatchville Rd (Falmouth, MA) DEP File #: ______

Check all that apply:

- ☐ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☐ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information)

Plot size: 15' x 30'

Section I. Vegetation Observation Plot Number: three Transect Number: Two Date of Delineation: 8·28·97

A. Sample Layer and Plant Species	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
Trees: red maple (Acer rubrum)	151/151	100%	YES	FAC
Saplings: red maple (A. rubrum)	26-50% (38.0)	78%	YES	FAC
Bebb willow (S. bebbiana)	6-15% (10.5)	22%	YES	FACW
* Shrubs: sweet pepperbush (C. alnifolia)	26-50% (38.0)	76%	YES	FAC+
Vines: Virginia creeper (P. quinquefolia)	1-5% (3.0)	22%	YES	FACU
Poison ivy	6-15% (10.5)	78%	YES	FAC

* Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c. 131, s.40); plants in the genus Sphagnum; plants listed as FAC, FAC+, FACW-, FACW, FACW_ or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

Herb. see attached worksheet. Dominant species are sweet pepperbush (seedlings) (FAC+) and cinnamon fern (FACW)

Vegetation conclusion:
Number of dominant wetland indicator plants: 7 Number of dominant non-wetland indicator plants: 1

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? Yes No

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent.

* Associated shrubs include: witherod, arrowwood, fetterbush, and young red maples

Plot No. 3
8.28.97

ATTACHMENT II
HERBACEOUS VEGETATION SURVEY DATA SHEET

Date: 8.28.97 Site: Hatchville Road Field Crew: Schell & Berntsen Transect Coordinates (beginning): N ° ' " W ° ' "

Transect Number: Two Habitat Type: Scrub wetland Transect Coordinates (end): N ° ' " W ° ' "

Plot No. 3 (15'x30') (1m²

Species	% Cover Plot 1	% Cover Plot 2	% Cover Plot 3	% Cover Plot 4	% Cover Plot 5	Comments
Overall Plot Cover						Dominants
Violet	1-5%					are sweet
Marsh St. Johns wort	6-15%	trace				pepperbush and
Red maple	trace			trace		Cinnamon
Sweet pepperbush	6-15%		6-15%	6-15%	51-75%	fern.
Sedge	6-15%		trace			
Sphagnum moss	6-15%			1-5%		
water horehound	trace					
swamp candles	trace	trace				
Cinnamon fern		26-50%	6-15%	26-50%		
starflower		trace	trace	trace		
marsh fern		1-5%	1-5%		1-5%	
Poison Ivy		1-5%		trace		
Bartonia paniculata		trace				
Canada mayflower			trace	trace	1-5%	
leaf litter/bare ground	51-75%	76-95%	51-75%	76-95%	96-100%	

% Cover to nearest 20 % by species. Include % bare ground. For species occupying less than 20% plot use less-than symbol (<).

[illegible]
plot 1
8.22.97

ATTACHMENT II
HERBACEOUS VEGETATION SURVEY DATA SHEET

Date: 8.22.97 Site: Hatchville road Field Crew: Schell + Bemben Transect Coordinates (beginning): N ° ' " W ° ' "

Transect Number: Three Habitat Type: Forest/shrub wetland Transect Coordinates (end): N ° ' " W ° ' "

plot no. 1 (15' x 30') (1m²)

Species	% Cover Plot 1	% Cover Plot 2	% Cover Plot 3	% Cover Plot 4	% Cover Plot 5	Comments
Overall Plot Cover						
marsh fern	6-15%	6-15%	trace		1-5%	Dominant
sensitive fern	1-5%		6-15%	trace		plants are:
Canada May flower	trace		trace	1-5%	trace	sweet
sweet pepperbush	6-15%	6-15%	6-15%	16-25%	6-15%	pepperbush seedlings
red maple		trace		trace		and fern cover.
Japanese barberry			6-15%			
starflower			1-5%	1-5%		
swamp azalea			1-5%			
Dangleberry			trace			
Arrowwood				trace		
Black alder				1-5%		
Poison ivy				trace		
leaf litter/bare ground	96-100%	96-100%	76-95%	51-75%	76-95%	

% Cover to nearest 20 % by species. Include % bare ground. For species occupying less than 20% plot use less-than symbol (<).

Plot 1
8.22.97

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? (Yes) No

Title/date: Soil Survey of Barnstable Co, MA. 1993

Map number: 31

Soil type mapped: Freetown coarse sand

Hydric Soil Inclusions: Ft = Freetown coarse sand

Are field observations consistent with soil survey? (Yes) No

Remarks: Forest wetland on abandoned cranberry bog. Altered soil profile.

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
Oe1	0-2½"	5YR2.5/2 dark reddish brown partially decomposed peat	
Oe2	2½"-5"	5YR2.5/2 dark reddish brown well decomposed organic mat. (5YR2.5/1)	
Ay	5"-9"	10YR4/2. dark grayish brown coarse sand. Free water at 8". Soil transitions to 10YR3/1 very dark gray sand at 9".	
B	9"-13"		
Ob	13"-18"	Buried organic muck 5YR2.5/1 black	

Remarks:

3. Other

Conclusion: Is soil hydric? (Yes) No

Other Indicators of Hydrology: (check all that apply and describe)

- ☐ Site inundated: seasonal flooding in low areas
- ☒ Depth to free water in observation hole: 8"
- ☒ Depth to soil saturation in observation hole: saturated to surface
- ☐ Water marks: not observed
- ☐ Drift lines: not observed
- ☐ Sediment deposits: not observed
- ☒ Drainage patterns in BVW: observed
- ☐ Oxidized rhizospheres:
- ☒ Water-stained leaves: observed
- ☒ Recorded data (stream, lake, or tidal gauge; aerial photo; other): Aerial photo
- ☐ Other:

Vegetation and Hydrology Conclusion

	Yes	No
Number of wetland indicator plants ≥ number of non-wetland indicator plants	☒	☐
Wetland hydrology present:		
Hydric soil present	☒	☐
Other indicators of hydrology	☒	☐
Present	☐	☐
Sample location is in a BVW	☒	☐

Transect three
plot two (30'r)

ATTACHMENT III
DEP BORDERING VEGETATED WETLAND (310 CMR 10.55) DELINEATION FIELD DATA FORM

Applicant: JEG Prepared by: schall + Berntsen Project location: Hatchville Road Falmouth, MA. DEP File #: ______

Check all that apply:

☐ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
☐ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
☐ Method other than dominance test used (attach additional information)

Plot size: 30'r in Forested wetland.

Section I. Vegetation Observation Plot Number: TWO Transect Number: Three Date of Delineation: 8.21.97

A. Sample Layer and Plant Species	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
Trees: red maple (Acer rubrum)	1180/1180	100%	yes	FAC
Saplings: red maple (Acer rubrum)	6-15% (10.5)	50%	yes	FAC
gray birch (Betula populifolia)	6-15% (10.5)	50%	yes	FAC
Shrubs: sweet pepperbush (clethra alnifolia)	26-50% (38.0)	29%	yes	FAC+
highbush blueberry (Vaccinium corymbosum)	26-50% (38.0)	29%	yes	FACW
swamp azalea (Rhododendron viscosum)	16-25% (20.5)	16%	no	OBL
multiflora rose (multiflora rose)	16-25% (20.5)	16%	no	FACU
Vines: poison ivy (T. radicans)	6-15% (10.5)	100%	yes	FAC
Herbs: sweet pepperbush (seedlings)	26-50% (38/20.5)	50%	yes	FAC+

* Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c. 131, s.40); plants in the genus Sphagnum; plants listed as FAC, FAC+, FACW-, FACW, FACW_ or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

Vegetation conclusion:
Number of dominant wetland indicator plants: 7 Number of dominant non-wetland indicator plants: 0

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? Yes No

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent.

Associated herbaceous species included: cinnamon fern, sensitive fern, marsh fern, Canada mayflower, swamp [illegible]

plot.
8·22·97

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? Yes No

Title/date: Soil Survey of Barnstable Co, MA. 1993

Map number: 31

Soil type mapped: Freetown Coarse Sand

Hydric Soil inclusions: Ft = Freetown coarse sand

Are field observations consistent with soil survey? Yes No

Remarks: Soil plot in Forested wetland on abandoned cranberry Bog. Altered soil profile.

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
O_{e1}	0-2"	5YR2.5,2 dark reddish brown partially decomposed organic mat.	
Oe_2	2"-5"	5YR2.5,2. dark reddish brown well decomposed organic mat. fine roots	
Ap	5"-12"	10YR4,2. dark grayish brown coarse sand, st. gravel. standing water at 5"	
Ob	12"-18"	10YR 2,1 Black muck, buried O horizon.	

Remarks:

3. Other

Conclusion: Is soil hydric? Yes No

Other Indicators of Hydrology: (check all that apply and describe)

- ☒ Site inundated: Seasonal inundation
- ☒ Depth to free water in observation hole: 5"
- ☒ Depth to soil saturation in observation hole: Saturated to surface
- ☐ Water marks: not observed
- ☐ Drift lines: not observed
- ☐ Sediment deposits: not observed
- ☐ Drainage patterns in BVW: not observed
- ☐ Oxidized rhizospheres: not observed
- ☒ Water-stained leaves: observed.
- ☒ Recorded data (stream, lake, or tidal gauge; aerial photo; other): Aerial photo
- ☐ Other:

Vegetation and Hydrology Conclusion

	Yes	No
Number of wetland indicator plants ≥ number of non-wetland indicator plants	☒	☐
Wetland hydrology present:		
Hydric soil present	☒	☐
Other indicators of hydrology	☒	☐
Present	☐	☐
Sample location is in a BVW	☒	☐

ATTACHMENT III
DEP BORDERING VEGETATED WETLAND (310 CMR 10.55) DELINEATION FIELD DATA FORM

Applicant: JEG Prepared by: Schell + Bernitsen Project location: Hatchville Road Falmouth, MA DEP File #: ______

Plot Size 15' x 30'

Check all that apply:

- ☐ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☐ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information)

Date of Delineation: 8.22.97

Section I. Vegetation Observation Plot Number: One Transect Number: Four

A. Sample Layer and Plant Species	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
Trees: red maple (Acer rubrum)	100.5/100.5	100%	YES	FAC
Saplings: red maple (A. rubrum)	6-15% (10.5)	100%	YES	FAC
* Shrubs: sweet pepperbush (C. alnifolia)	16-25% (20.5)	30%	YES	FAC+
HB. Blueberry (V. corymbosum)	16-25% (20.5)	30%	YES	FACW
Vines: poison ivy (T. radicans)	1-5% (3.0)	100%	YES	FAC
Herbaceous: see worksheet attached.			YES	FAC+

* Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c. 131, s.40); plants in the genus Sphagnum; plants listed as FAC, FAC+, FACW-, FACW, FACW_ or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

sweet pepperbush is dominant

Vegetation conclusion:
Number of dominant wetland indicator plants: 6 Number of dominant non-wetland indicator plants: 0

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? Yes No

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent.

* Associated shrubs included: arrowwood, speckled alder, sweetgale, and swamp azalea.

plot 1.
8.22.97

ATTACHMENT II
HERBACEOUS VEGETATION SURVEY DATA SHEET

Date: 8.22.97 Site: Hatchville Road Field Crew: Schell + Berntsen Transect Coordinates (beginning): N ____ ° ____ ' ____ " W ____ ° ____ ' ____ "

Transect Number: Four, plot one Habitat Type: Forest/shrub Transect Coordinates (end): N ____ ° ____ ' ____ " W ____ ° ____ ' ____ "

$1 m^2$ HERB. PLOTS.

Species	% Cover Plot 1	% Cover Plot 2	% Cover Plot 3	% Cover Plot 4	% Cover Plot 5	Comments
Overall Plot Cover						
sweet pepperbush	16-25%	6-15%	6-15%	1-5%		low shrub +
swamp dewberry	1-5%		1-5%			seedlings.
marsh fern	trace					Dominant
arrowwood	trace	1-5%				cover is sweet
poison ivy	trace					pepperbush.
Bartonia paniculata	trace					
Beggar-ticks		trace				
sheep laurel			trace			
sphagnum moss				1-5%		
sweet gale					1-5%	
leaf cover	>95%	>85%	>95%	>95%	>95%	

% Cover to nearest 20 % by species. Include % bare ground. For species occupying less than 20% plot use less-than symbol (<).

[illegible]
Plot 1.
8.22.97

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? Yes No

Title/date: Soil Survey of Barnstable Co, MA. 1993

Map number: 31

Soil type mapped: Ft = Freetown coarse sand

Hydric Soil Inclusions: Freetown coarse sand

Are field observations consistent with soil survey? Yes No

Remarks: soil pit on abandoned cranberry bog margin near River.

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
Oi	1/2"-0	loose leaf litter	
Oe	0 - 9"	organic peat 5YR 2.5, 2 Dark reddish brown. Free water at 9"	
Bh	9-12"	7.5YR 3,3. Dark brown Coarse sand	

Remarks:

3. Other

Conclusion: Is soil hydric? Yes No

Other Indicators of Hydrology: (check all that apply and describe)

- ☒ Site inundated: seasonal flooding from river
- ☒ Depth to free water in observation hole: 9"
- ☒ Depth to soil saturation in observation hole: ± 3"
- ☐ Water marks: not observed
- ☒ Drift lines: observed on margin of river bank
- ☐ Sediment deposits: not observed
- ☒ Drainage patterns in BVW: observed old ditch
- ☐ Oxidized rhizospheres: not observed
- ☒ Water-stained leaves: observed
- ☒ Recorded data (stream, lake, or tidal gauge; aerial photo; other): aerial photo
- ☐ Other:

Vegetation and Hydrology Conclusion	Yes	No
Number of wetland indicator plants ≥ number of non-wetland indicator plants	☒	☐
Wetland hydrology present:		
Hydric soil present	☒	☐
Other indicators of hydrology	☒	☐
Present	☐	☐
Sample location is in a BVW	☒	☐

"Transect four" plot two (30'r)

ATTACHMENT III
DEP BORDERING VEGETATED WETLAND (310 CMR 10.55) DELINEATION FIELD DATA FORM

Applicant: JEG Prepared by: Schell + Berntsen Project location: Hatchville Road Falmouth, MA. DEP File #: ____

Check all that apply:

- ☐ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☐ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information)

Plot size: 30' radius

Section I. Vegetation Observation Plot Number: Two Transect Number: Four Date of Delineation: 8.22.97

A. Sample Layer and Plant Species	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
Trees: red maple (Acer rubrum)	722/722	100 %	YES	FAC
Saplings: red maple (A. rubrum)	16 - 25% (20.5)	87%	YES	FAC
pitch pine (Pinus rigida)	1 - 5% (3.0)	13%	no	
Shrubs*: Highbush blueberry (V. corymbosum)	16 - 25% (20.5)	27%	YES	FACW
sweet pepperbush (C. alnifolia)	26 - 50% (38.0)	51%	YES	FAC+
Vines: common Bullbrier (S. rotundifolia)	1 - 5% (3.0)	100%	YES	FAC

* Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c. 131, s.40); plants in the genus Sphagnum; plants listed as FAC, FAC+, FACW-, FACW, FACW_ or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

Herbs: cinnamon fern (O. cinnamomea)	6 - 15% (10.5)	30%	YES	FACW
royal fern (O. regalis)	6 - 15% (10.5)	30%	YES	OBL
** sweet pepperbush (C. alnifolia)	6 - 15% (10.5)	30%	YES	FAC+

Vegetation conclusion:
Number of dominant wetland indicator plants: 8 Number of dominant non-wetland indicator plants: 0

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? Yes No
If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent.

* Associated species include swamp azalea, purple chokeberry & black alder. 3 Herbaceous: Bartonia paniculata, and purple chokeberry trace.

Transect 5
plots A - F
(1m²)
8·28·97

ATTACHMENT II
HERBACEOUS VEGETATION SURVEY DATA SHEET

Date: 8·28·97 Site: Hatchville road Field Crew: Schill/Bonnsen Transect Coordinates (beginning): N ___° ___' ___" W ___° ___' ___"

Transect Number: Fill (5) Plots A - F (1m²) Habitat Type: Scrub/shrub wetland Transect Coordinates (end): N ___° ___' ___" W ___° ___' ___"

Species	% Cover Plot 1	% Cover Plot 2	% Cover Plot 3	% Cover Plot 4	% Cover Plot 5	Comments
Overall Plot Cover						
Red maple						
Burreed						
Cranberry-vine	16-25%					
Wool grass	6-15%					
Soft Rush						
Marsh St. Johnswort						
Watershield						
Black alder						
Willow	26-50%					
Panic grass	1-5%					
Sweet pepperbush	1-5%					
Sedge	1-5%					
Water	96-100%					

% Cover to nearest 20 % by species. Include % bare ground. For species occupying less than 20% plot use less-than symbol (<).

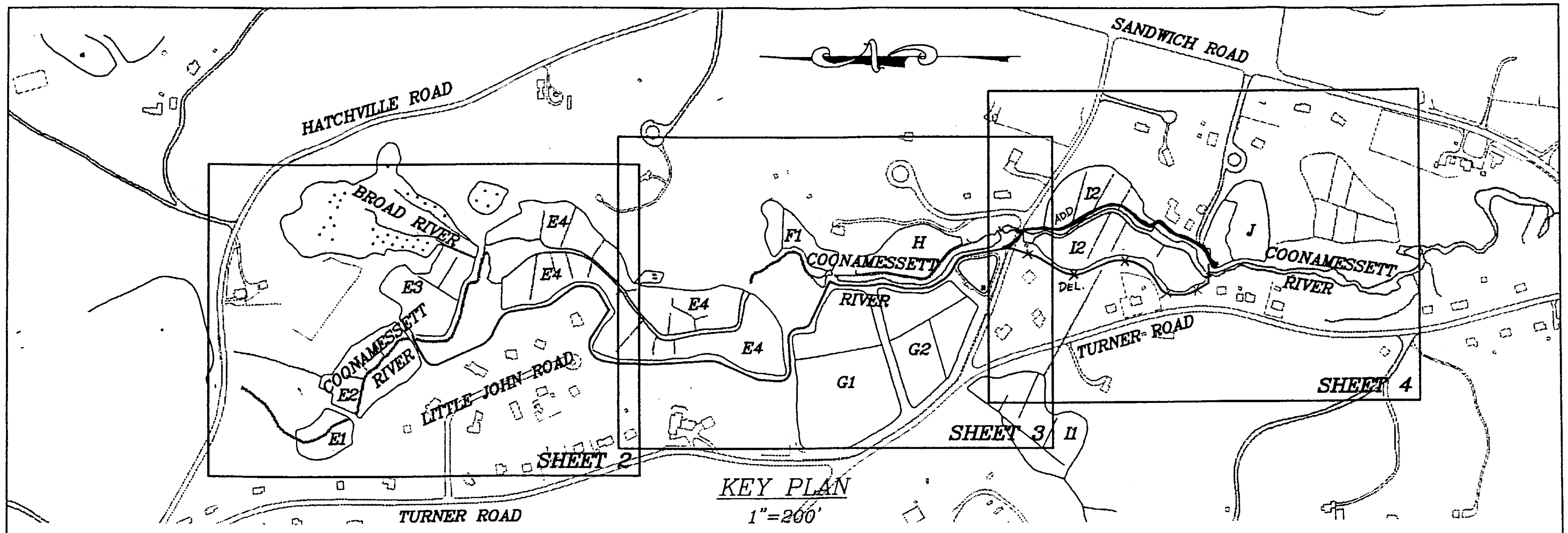
APPENDIX C

SITE PLANS

WATER LINE CONSTRUCTION / IMPROVEMENTS

ALONG THE COONAMESSETT RIVER

FALMOUTH, MASSACHUSETTS



KEY PLAN
1"=200'

LEGEND		
EXISTING	DESC.	PROPOSED
	WATER MAIN PIPE	1+00 18" HDPE 2+00
	GATE VALVE & VALVE BOX (G.V.)	
	EROSION CONTROL BARRIER (SILT FENCE AND/OR HAYBALES)	
	CONCRETE THRUST BLOCK	
	BEND	
	CAP OR PLUG/COUPLING	
	TEE/TAPPING SLEEVE	
	FLUME	
	SHEET PILE	
30	CONTOUR-INDEX	30
	CONTOUR-INTERMEDIATE	
	SPOT GRADE	24.0 X / 24.0 X
HDPE	HIGH DENSITY POLYETHYLENE	HDPE
CMP	CORRUGATED METAL PIPE	CMP
CPP	CORRUGATED PLASTIC PIPE	CPP
EXIST.	EXISTING	

LOCUS 1"=2083'

SHEET INDEX

1. TITLE SHEET, KEY PLAN
2. PLAN OF WATER LINE CONSTRUCTION
3. PLAN OF WATER LINE CONSTRUCTION
4. PLAN OF WATER LINE CONSTRUCTION
5. DETAILS

AS-NOTED

REV.	DATE	BY	APP'D	DESCRIPTION
01	11-24-98	PAW		ALIGN.

DATE: 10-22-98
DRAWN BY: P.A.W.
CHECKED BY: W.F.M.
JOB NO.: 98-4355
SCALE: AS-NOTED

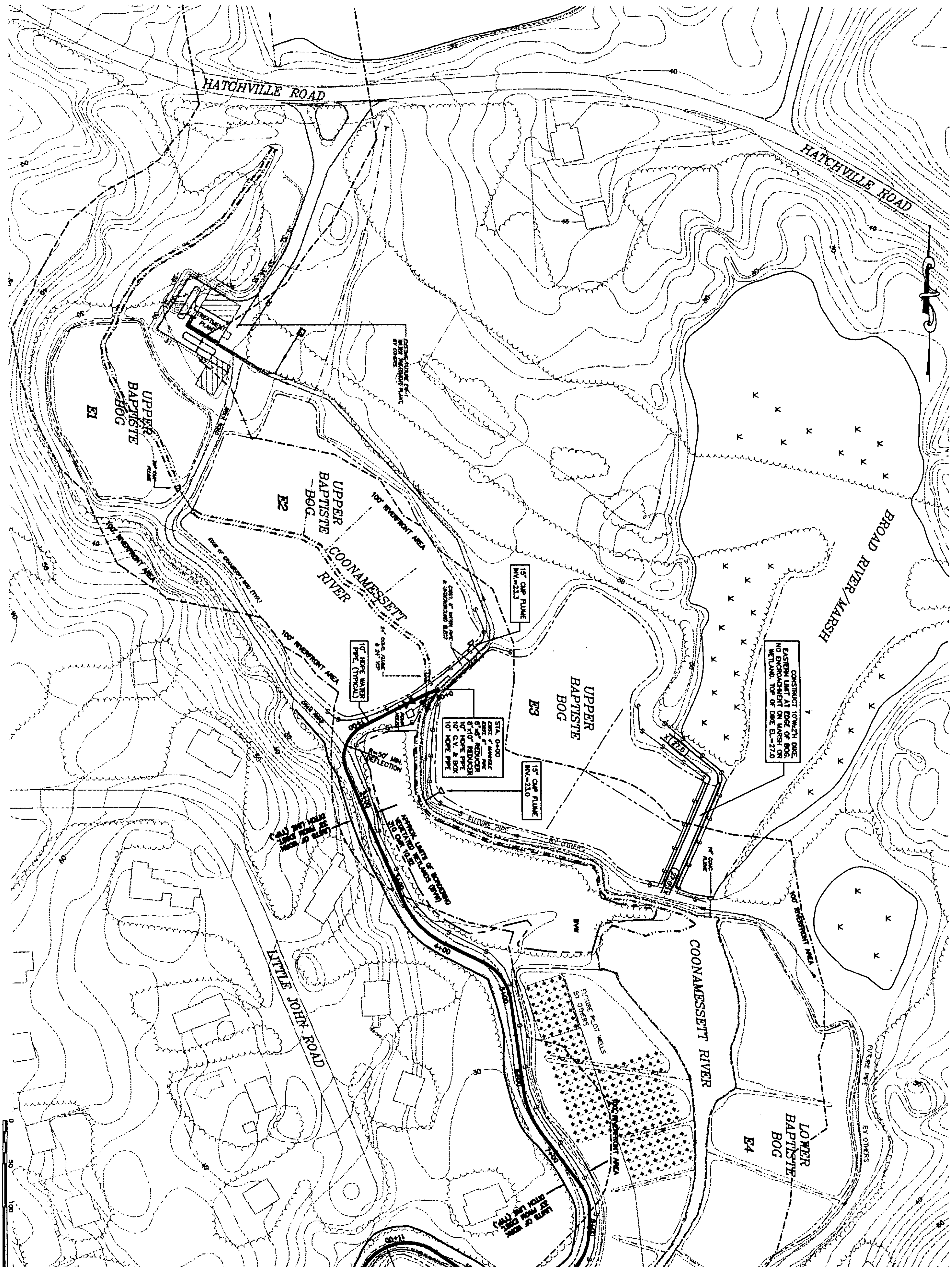
APPROVED BY:
APPROVED BY:

DRAFT

G.A.F. ENGINEERING, INC.
PROFESSIONAL ENGINEERS & LAND SURVEYORS
454 WAREHAM STREET, PO BOX 953, MARION, MA 02738
TEL: (508) 748-0252 FAX: (508) 748-0542
E-MAIL: gafeng@capecod.net

TITLE SHEET
KEY PLAN
PREPARED FOR:
MMR/JACOBS ENGINEERING GROUP, INC.
COONAMESSETT RIVER FALMOUTH, MA

JOB NO.: 98-4355
DWG.
1 OF 5



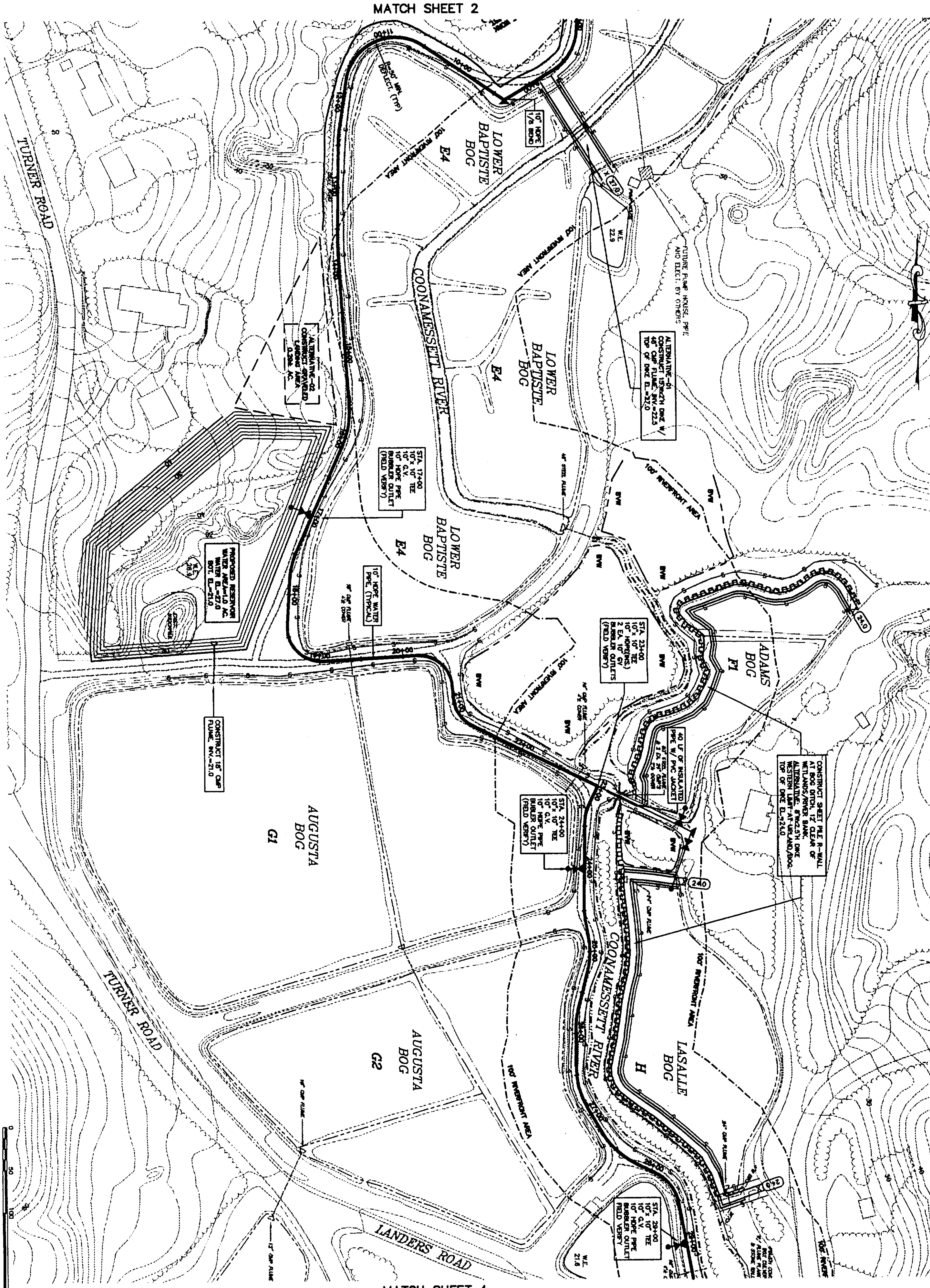
MATCH SHEET 3

DWG. 2 OF 5	JOB NO.: 98-4335	PLAN OF WATER LINE CONSTRUCTION/IMPROVEMENTS PREPARED FOR: MMR/JACOBS ENGINEERING GROUP, INC. COONAMESSETT RIVER FALMOUTH, MA.	G.A.F. ENGINEERING, INC. PROFESSIONAL ENGINEERS & LAND SURVEYORS 454 WAREHAM STREET, PO BOX 953, MARION, MA 02738 TEL: (508) 748-0252 FAX: (508) 748-0542 E-MAIL: gafeng@capecod.net	APPROVED BY:	APPROVED BY:

DATE: 11-24-98
DRAWN BY: P.A.W.
CHECKED BY: W.F.M.
JOB NO.: 98-4355
SCALE: 1" = 50'

REV.	DATE	BY	APP'D	DESCRIPTION

MATCH SHEET 2



MATCH SHEET 4

DWG. 3 OF 5	JOB NO: 98-4355	

PLAN OF WATER LINE CONSTRUCTION/IMPROVEMENTS

PREPARED FOR:

MMR/JACOBS ENGINEERING GROUP, INC.

COONAMESSETT RIVER FALMOUTH, MA.

G.A.F. ENGINEERING, INC.

PROFESSIONAL ENGINEERS & LAND SURVEYORS

454 WAREHAM STREET, PO BOX 953, MARION, MA 02738

TEL: (508) 748-0252 FAX: (508) 748-0542

E-MAIL: gafeng@capecod.net

APPROVED BY:

APPROVED BY:

DATE: 11-24-98

DRAWN BY: P.A.W.

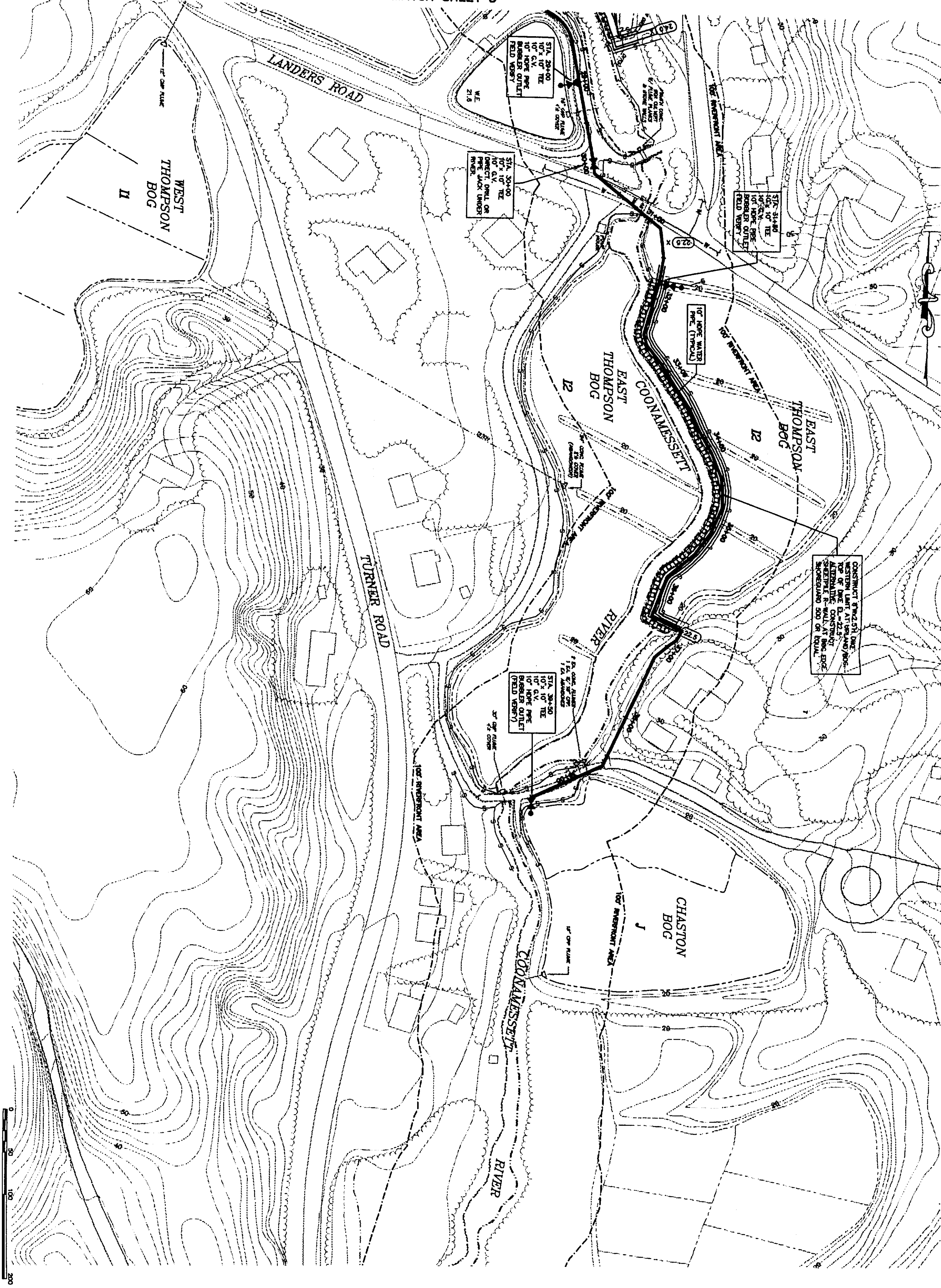
CHECKED BY: W.F.M.

JOB NO.: 98-4355

SCALE: 1" = 50'

REV.	DATE	BY	APP'D	DESCRIPTION

MATCH SHEET 3



DWG. 4 OF 5	JOB NO.: 98-4355	PLAN OF WATER LINE CONSTRUCTION/IMPROVEMENTS PREPARED FOR: MMR/JACOBS ENGINEERING GROUP, INC. COONAMESSETT RIVER FALMOUTH, MA.	G.A.F. ENGINEERING, INC. PROFESSIONAL ENGINEERS & LAND SURVEYORS 454 WAREHAM STREET, PO BOX 953, MARION, MA 02738 TEL: (508) 748-0252 FAX: (508) 748-0542 E-MAIL: gafeng@capecod.net	APPROVED BY:	APPROVED BY:

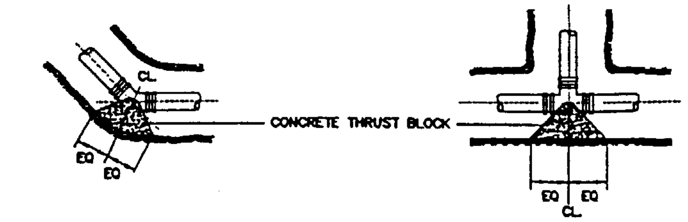
DATE:	11-24-98
DRAWN BY:	P.A.W.
CHECKED BY:	W.F.M.
JOB NO.:	98-4355
SCALE:	1" = 50'

REV.	DATE	BY	APP'D	DESCRIPTION

CONCRETE ANCHOR REQUIREMENTS

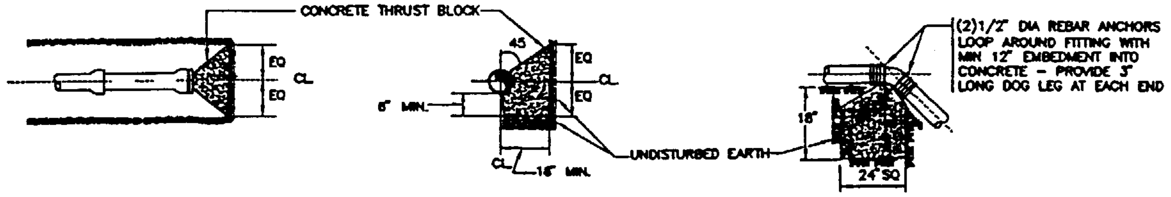
BASED ON: TEST PRESSURE = 150 PSI
CONC. STRENGTH = 3000 PSI
BEARING CAP. = 1500 PSF

FITTING	MIN. BEARING AREA
10" TEE	10.0 SQ.FT.
10" 1/4 BEND	14.0 SQ.FT.
10" 1/8 BEND	11.0 SQ.FT.
10" 1/16 BEND	11.0 SQ.FT.
10" DEAD END	10.0 SQ.FT.



PLAN HORIZONTAL BEND
(TYPICAL @ 1/4, 1/8, 1/16 BENDS)

PLAN TEE



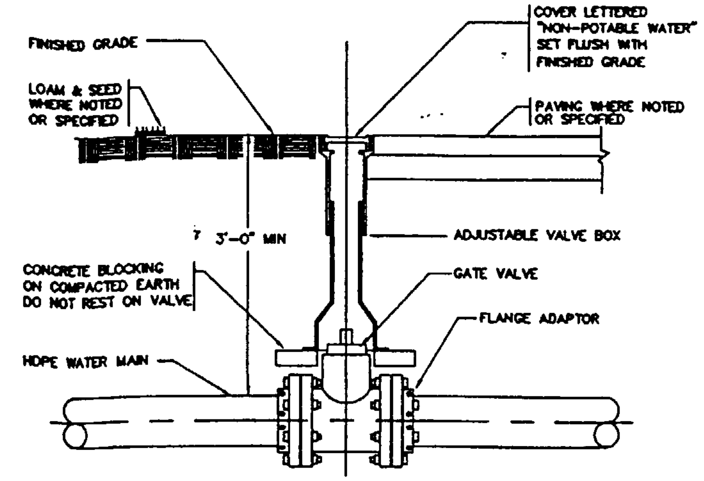
PLAN PLUG/END CAP

TYPICAL SECTION

VERTICAL BEND

CONCRETE THRUST BLOCK DETAILS

NO SCALE



DETAIL (IN ROADWAY) GATE VALVE INSTALLATION

NO SCALE

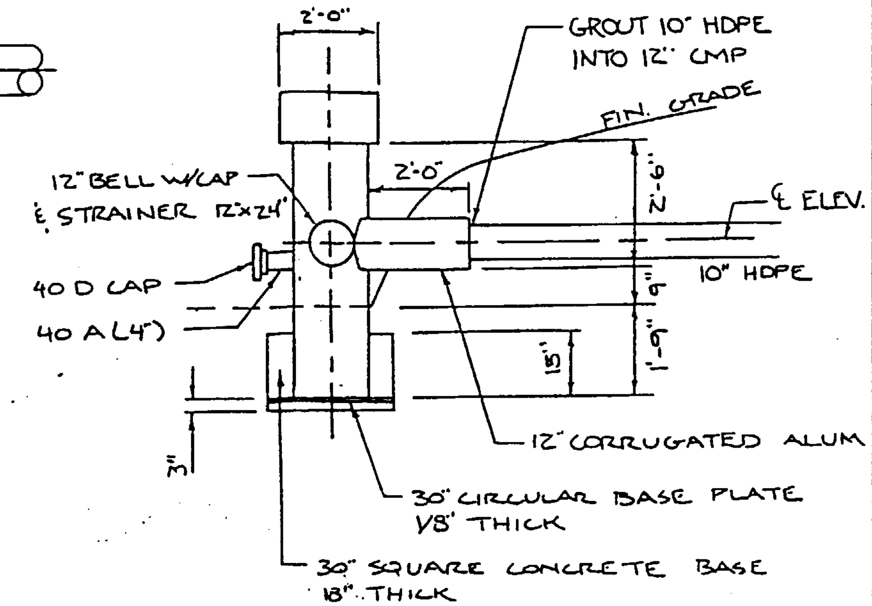
NOTES:

1. SIDE SLOPES SHALL NOT EXCEED 3:1 EXCEPT FOR THE INTERIOR DIKES. EXPOSED SIDE SLOPES SHALL BE DRESSED WITH 4 TO 6 INCHES OF TOPSOIL.
2. PERMANENT SEEDING (BEFORE SEPTEMBER 15) LIME TO PH OF 6.5 ACCORDING TO SOIL TEST OR APPLY AT THE RATE OF 100 TO 150 LBS. PER 1,000 SQUARE FEET. APPLY 10-20-20 FERTILIZER AT 1,000 LBS. PER ACRE. INCOPORATE LIME AND FERTILIZER IN TOP 4 INCHES OF SOIL. SEED 100 LBS. PER ACRE OF THE FOLLOWING SEED MIX.

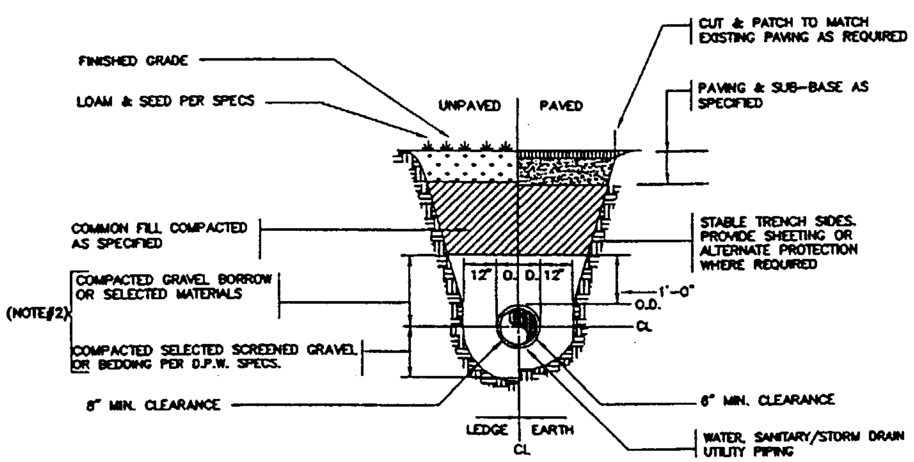
PURE PERCENT	SEED
30-35%	CREEPING RED FESCUE
30-35%	PERENNIAL RYEGRASS
20-25%	KENTUCKY BLUEGRASS
10-15%	ANNUAL RYEGRASS

HYDRO SEEDING IS AN ALTERNATIVE FOR THIS APPLICATION. A MIXTURE OF SEED WATER AND MULCH IS SPRAYED ON THE SEED BED COMBINING THREE (3) SEPRATE ACTIONS INTO ONE (1) OPERATION

3. ALL ELEVATIONS ARE BASED ON N.G.V. DATUM.
4. ALL CONSTRUCTION SHALL CONFORM WITH N.C.R.S. BEST MANAGEMENT PRACTICES.



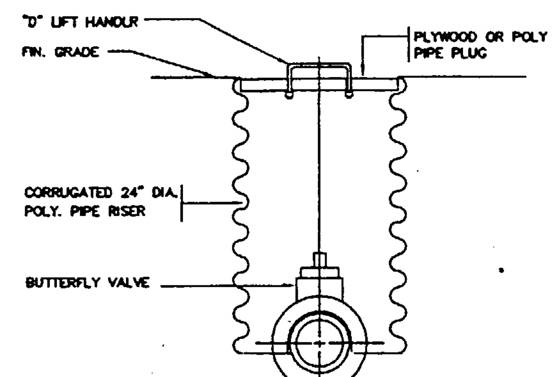
BLUBBLER OUTLET
N.T.S.



TYPICALTRENCH DETAIL

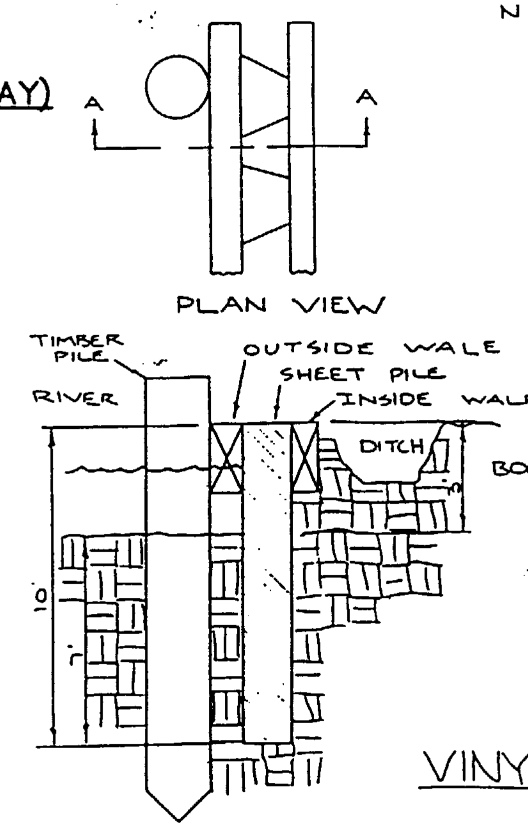
NOT TO SCALE

NOTES: 1. MINIMUM DEPTH OF BURY FOR WATER PIPING SHALL BE 3'-0"
2. BACK FILL AROUND P.V.C. PIPE SHALL BE WASHED SAND. NO MATERIAL EXCAVATED FROM TRENCH SHALL BE PERMITTED. COMPACT IN 6" LIFTS.



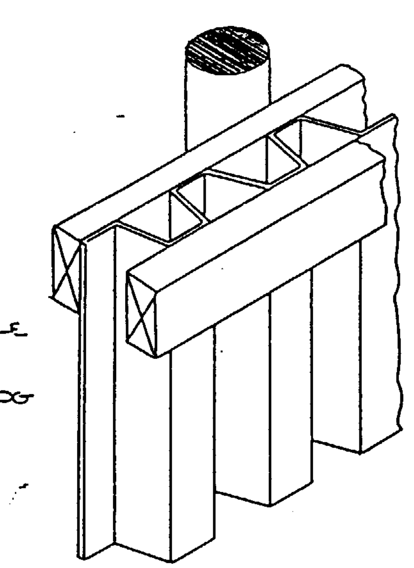
ALTERNATE VALVE BOX RISER (OFF ROADWAY)

NO SCALE

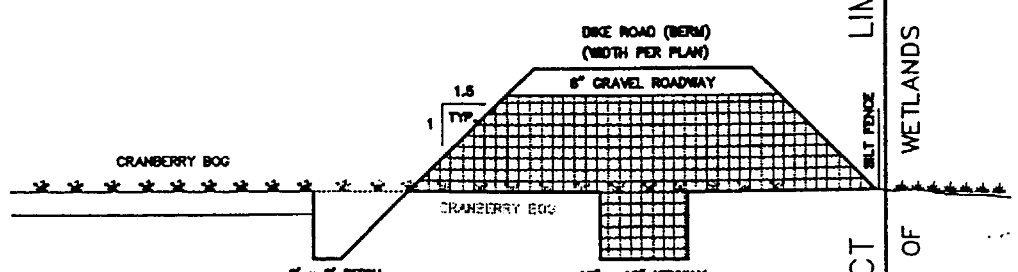


PLAN VIEW

SECTION A-A

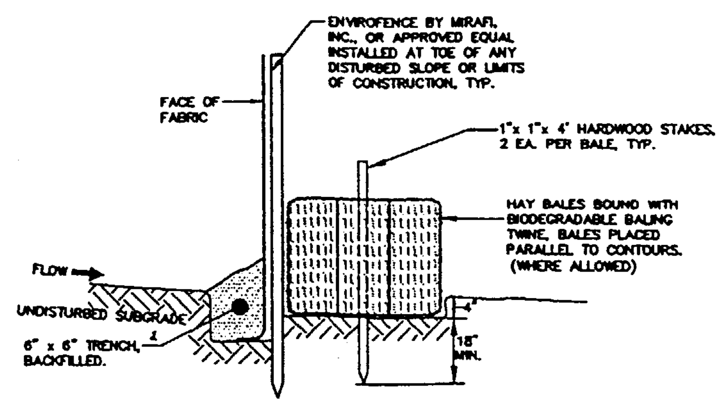


VINYL SHEET PILING



DIKE ROAD DETAIL

N.T.S.



NOTES:
1. SILTATION FENCE SHALL BE "ENVIROFENCE" AS MANUFACTURED BY MIRAFI, INC. OR AN APPROVED EQUAL.
2. SILTATION FENCING SHALL BE INSTALLED DOWNSLOPE OF ALL PROPOSED AND EXISTING DISTURBED AREAS, OR AS SHOWN ON THE PLANS.
3. EROSION CONTROL MEASURES SHALL BE MAINTAINED UNTIL VEGETATIVE COVER HAS BEEN FIRMLY ESTABLISHED.
4. EROSION CONTROL MEASURES SHALL FOLLOW THE PERFORMANCE STANDARDS OF THE USDA SOIL CONSERVATION SERVICE, AND ANY APPLICABLE STATE/LOCAL CONSERVATION AUTHORITY.

SILTATION BARRIER DETAIL

N.T.S.

AS-NOTED

REV. | DATE | BY | APP'D | DESCRIPTION

DATE: 10-22-98
DRAWN BY: P.A.W.
CHECKED BY: W.F.M.
JOB NO.: 98-4355
SCALE: AS-NOTED

APPROVED BY:
APPROVED BY:

DRAFT

G.A.F. ENGINEERING, INC.
PROFESSIONAL ENGINEERS & LAND SURVEYORS
454 WAREHAM STREET, PO BOX 933, MARION, MA 02738
TEL: (508) 748-0252 FAX: (508) 748-0542
E-MAIL: gafeng@capecod.net

DETAIL SHEET

PREPARED FOR:
MMR/JACOBS ENGINEERING GROUP, INC.
COONAMESSETT RIVER
FALMOUTH, MA

JOB NO.: 98-4355
DWG.
5 OF 5

APPENDIX D

REGULATORY COMMENTS AND RESPONSES

ATTACHMENT

The following are EPA's comments on the *Draft Engineering Evaluation, Cost Analysis and Execution Plan for Coonamessett River FS-28 Bog Separation Project* dated October 1998

General Comments

1. The presentation of this document gives the impression that a decision has already been made regarding the alternative to be implemented. The fact that it is called an EE/CA **and Execution Plan**, the inclusion of Section 6.0 (Construction Plan) and the use of the term "will" rather than "would" throughout the document lead the reader to believe that Alternative E is a done deal. This sends the wrong message to the public regarding AFCEE's willingness to consider public input during the upcoming comment period (November 27th to December 31st). Therefore for the document to be released for the public comment period, EPA recommends removal of Section 6, revision of document per our specific comments below, and issuance of the revised EE/CA document with a fact sheet presenting AFCEE's preferred alternative.

Response: As discussed at a resolution meeting on November 19, 1998. A paragraph will be added to the beginning of section 5.0 that references the effectiveness, implementabltiy and costs guidelines. Table 5.1 will be referenced to compare the effectiveness and implementablity of the alternatives. A final paragraph will be added at the end of section 5.0 which details the selection of the preferred alternative. This approach will be to compare all of the alternatives in a summary fashion while presenting the selection of the preferred alternative. Section 6.0 will remain in the document as stated but an introduction paragraph will be written that states that the preferred alternative was described since it is needed to secure a permit from the town of Falmouth and the State.

The following paragraph will be added to the introduction of Section 5.0
Following EPA guidance document for non-time critical removal actions (EPA, 1993), the alternatives were evaluated for their effectiveness, implementability, and cost. This evaluation is presented and summarized in Table 5-1 for each of the alternatives. The table provides a side by side comparison of the alternatives while the descriptions are provided in the following paragraphs. Evaluating the protectiveness to the public and workers and the ability of the alternative to achieve the removal action objectives addresses the effectiveness of the alternatives being considered. Implementability of the alternatives is evaluated by assessing technical and administrative feasibility and availability of equipment and personnel. Table 5-1 also presents the capital, operation and maintenance costs and the present worth of the alternative.

The following section will be added to Section 5.0
5.7 Comparison of the Alternatives
During the many stakeholder meetings that have been held to address the EDB contamination in the Coonamessett River it was obvious that alternatives A through D could not satisfy all of objectives or be accepted by the stakeholders. However, there were elements within each that

were acceptable which is why Alternative E was derived and advanced forward as the preferred alternative by AFCEE. Those favorable elements from the various plans included providing an alternative water source to the upper bogs, separating some of the bogs from the river and providing active treatment to reduce the level of contamination in the river.

Alternative A was not acceptable to the regulatory agencies, growers, or AFCEE since there is no reduction in the EDB contamination in the river system. Alternative A basically takes the bogs out of production until acceptable levels are found in the river system. Because of the compensation, Alternative A was one of the more expensive alternatives. Furthermore, additional legislation would need to be obtained for compensation beyond the authorized two year period.

Alternative B relies on passive treatment to reduce the levels in the river after creating storage basins when the upper part of the Coonamessett River was moved to one of the perimeter bog ditches. Alternative B also lined a portion of the new river channel to eliminate contamination in the new channel and it includes construction of a berm on the Adams bog to separate the bog from the river. While the alternative was technically feasible, it is not administratively feasible since moving the river and changing the ecological system would require federal permits be obtained which could take well over one or two years to secure. Furthermore, there is an element of risk that the alternative may not passively reduce the concentrations because the detention time in the basins may not be long enough. However, separation of the Adams bog is administratively feasible since the berm would be constructed on the active bog thereby exempting the construction activity from federal and state permitting as discussed in Section 3.0. Separation removes the contaminated river water from the active portion of the bog. This separation has been actively demonstrated on the Augusta and Chaston bogs with monthly surface water sampling events. Thus, separation of the upper bogs as described in Alternative E was advanced since it is effective and implementable.

Separation alone, as described in Alternative D, is not technically feasible. Alternative D relies on water management practices between the bog growers to provide a source of clean water. During the winter the growers take water on and off the bogs depending on air temperatures, snow, and ice. In addition, there will be loss of water from the bogs that will need to be replenished on a daily or weekly basis. For these reasons, alternative D by itself is not technically feasible. AFCEE has demonstrated that when lower Baptiste bog is flooded that the EDB concentrations in the river can achieve non-detect entering Pond 14. Therefore, if alternative water is provided to the upper bogs (Chaston, Augusta, Thompson, Adams, and Lassalle) and active treatment is added to reduce EDB concentrations in the river system, then the all of the bogs can be protected.

Alternative C1 included active treatment and expansion of the treatment plant, but the quantity of water that would be removed by this alternative may result in unacceptable ecological impacts and it also relied upon moving the river channel. However, Alternative C2 does not require that the channel be moved, but unlike alternative C1 there will still be detectable levels in the river system. C2 relies on removing enough EDB mass prior to reaching surface water such that the level in the river leaving the Baptist bog is less than 0.04 ug/L. Thus, alternative C2 with

portions of Alternative B and D are effective and implementable and were retained as part of Alternative E.

Alternative E includes active treatment using the shallow well points to reduce the concentrations and the treated water is used as an alternative water source for the upper bogs. The treated water would be used to fill the bogs for winter protection and to replenish the volume lost to leakage. Alternative E also includes storage of treated water near the Augusta bog to provide another source of water for flooding. Alternative E incorporates the most effective and publicly acceptable elements of the other alternatives and is being advanced as the preferred alternative as described in Section 6.0. It is both technically and administratively feasible. Depending upon the level of active treatment that is required, the alternative is cost effective.

The following sentences will be added to the introduction of Section 6.0.

The preferred alternative is described in detail to begin the permit process. The components of the alternative may change during the permit process. These changes will be documented as Orders of Conditions on the permit application. Furthermore, it is anticipated that changes may also occur during the public information period. Changes will be described in the Action Memorandum when the final removal action is documented for the regulatory agencies.

2. The report uses the term "remedial action" when referring to the actions being undertaken pursuant to the EE/CA. This should be changed to "non-time-critical removal action" or simply "removal action" throughout.

Response: Text will be changed throughout to removal action.

3. Section 5.0 does not evaluate the alternatives in accordance with the AGuidance on Conducting Non-Time-Critical Removal Actions under CERCLA,@ EPA Publication 9360.0-32 (August 1993). Specifically, the document fails to evaluate the appropriate criteria in analyzing each alternative according to its effectiveness, implementability and cost. Rather, each alternatives is evaluated on its own advantages and disadvantages. See attached exhibit from the guidance which specifies the criteria that need to be evaluated. Most significant is the lack of any assessment of how each alternative meets (or fails to meet) the removal action objectives. In addition, the EE/CA fails to do a comparative analysis of the alternatives vis-a-vis each other.

Response: see response to first comment.

4. Table 3-1 - The ARARs table (Table 3-1) does not provide an adequate analysis. Separate tables should be provided for each alternative evaluated. Further, Section 5 of the EE/CA should analyze whether each alternative can meet the ARARs. A **preliminary** mark-up of Table 3-1 is attached.

Response: **ARARs table will be corrected as noted and each alternative will be covered in the last column rather then showing a table for each alternative.**

5. The proposed withdrawal of surface water from the Broad River should be carefully considered. The potential for dewatering impacts upon the river proper, adjacent wetlands, and particularly the nearby vernal pool must be fully evaluated. If adverse impacts are anticipated, any proposed mitigation measures must be described as well. EPA believes that if this activity is part of the active treatment portion of Alternative E, then it may significantly impact the extent of permit review (i.e., Individual Permit instead of Category II).

Response: **Withdrawal of surface water from Broad River is no longer being considered and will be removed from the text.**

6. Section 404(f)(1) Exemption - Originally, AFCEE proposed to construct earthen berms or install sheet pile at certain locations on specific bogs, and entirely on the bog surface. At the site walk on November 8th, it was proposed that sheet piles would be installed in the perimeter ditches of the Adams and LaSalle bogs. EPA would like to arrange a site visit during comment resolution process so that we can assess if and how this change affects the eligibility of this project for a § 404(b) permit exemption. In addition, we seek clarification on the berm with a water control structure (i.e., a flume) to be constructed across the middle of the lower Baptiste bog. This berm will enable the AF to flood this portion of the bog in winter to protect the piping system for the shallow well point extraction system from freezing. While the practical effect of this proposal may not differ materially from the routine practice of flooding bogs in the winter to protect cranberry vines, we would also like a site visit to ensure that this activity is within the exemption.

Response: **AFCEE submitted a series of photographs to show the proposed locations of the sheet pile and earthen berms. EPA has reviewed the photographs and concurs that the sheet piles can be located in the middle of the bog ditch channels as discussed in the field on November 8, 1998. Furthermore, EPA did not express any further concern for the berm across the lower Baptiste bog. EPA to write a letter to COE to address both issues and state that these activities are exempt or covered under the Category II permit process.**

7. Administrative Requirements for NPDES Permit for Discharge of Treated Water to Surface Water - Given that it has been determined that the CERCLA permit exemption does not apply to this project, AFCEE must meet the administrative requirements of the NPDES permit for discharges from the existing FS-28 treatment plant and the any new treatment plant. However, the regulations at 40 CFR §122.3(d) provide for a permit exclusion for "[a]ny discharge in compliance with the instructions of an On-Scene Coordinator pursuant to 40 CFR part 300...." For this project, EPA recommends that AFCEE apply for both an exclusion and for a permit through the normal application process. The application for the permit is required since the exclusion lasts for only six

months and discharges from the treatment plant are anticipated to continue for several years. (See Application Form 1 and Form 2C). The format for the exclusion is a letter from AFCEE to:

David Tordoff
Emergency Response Section
EPA
JFK Federal Building (HBR)
Boston, MA 02203

The letter should include: a brief project summary; sampling results (i.e., groundwater data with VOC and EDB since exclusion is for all contaminants); and a description of treatment system (i.e., maximum flow, treatment technology, discharge location, etc). Upon receipt of this letter, EPA would issue the exclusion and then likely require monthly reporting.

Form 1 and Form 2C should be addressed to Olga Vergara (Mailcode: CMU).

Response: Comment noted. AFCEE will prepare a letter as indicated above no later than December 1, 1998.

Specific Comments

8. ES-1, ¶ 1 - In line 2 & 6, change "remedial" to "removal."

Response: Agreed.

9. ES-1, Purpose Bullets - Combine 1 & 2 to be consistent with project purpose bullets on Page 1-1.

Response: Project purpose is both section written as follows:
"Protect human health by reducing risk from EDB in surface water, groundwater, and/or cranberry crops, while minimizing impacts to ecological systems

- Accelerate restoration of the Coonamessett River "

10. ES-1, ¶ 2 - Delete this paragraph since the proposed removal action is described in the following paragraphs.

Response: Comment noted. The paragraph serves to introduce the preferred alternative. Thus we believe that it should remain.

11. ES-1, ¶ 3 - a) Change the title and the first sentence in the next ¶ to read "preferred removal action alternative."

Response: agreed.

b) 1st Sentence - Please clarify if surface water will actually be removed from the Broad River as part of shallow well point extraction. See above general comment on surface water extraction from Broad River.

Response: surface water is no longer being considered in the preferred alternative. Sentence modified to delete the reference to surface water.

12. ES-2 & -3 - Rewrite the text in these sections to be less definitive, e.g., say "would@ instead of "will." See comment # 1, above. Also, under "Active Treatment," in the 1 st sentence, change "remedial action" to "removal action alternative."

Response: agreed.

13. ES-2, ¶ 3 - Clarification is requested on the shallow well point pilot test with regard to extraction of surface water from the Broad River. See above general comment.

Response: Surface water is no longer being considered and has been removed from the text.

14. ES-3, ¶ 1 - Revise text to reflect the decision to construct another building separate from the existing building.

Response: Sentence added to reflect that a new building may be required.

15. Page 1-1, §1.1 - In the first sentence, change "remediate" to "address."

Response: agreed.

16. § 1.2, 1.3 - It is not clear what the distinction is between the 'project purpose" and the "project objectives.@ Moreover, the purposes/objectives stated here should be consistent with those stated in the Executive Summary. For example, change "risk" to "exposure" since "exposure" is used on ES-1.

Response: Project purpose written such that both ES and Section 1 agree on the use of risk.

17. Page 1-2, §1.3 - The objectives in Section 1.3 need to be reworked.

a) In the first bullet, delete "If technically and economically feasible." This is presumed and is part of the "implementability" analysis.

Response: Comment noted. No change is proposed.

b) Simplify second bullet. Suggest revising sentence "Protect existing cranberry operations and decrease the risk of crop contamination by developing water management systems." If bog & river separation is the actual objective, then Alternative A would not even be evaluated.

Response: Agreed.

c) The third bullet is subsumed by the second.

Response: Comment noted. No change is proposed.

18. Page 1-2, §1.4 - Please rewrite the second sentence as follows: "In addition, the document describes the alternatives developed to meet the objectives described above and evaluates them by comparing their effectiveness, ease of implementation and cost."

Response: agreed.

19. Page 1-3, §1.4 - In the second ¶, change "remedial" to "removal" throughout.

Response: agreed.

20. Page 1-7, § 1.8 - The text states that EDB is the "primary contaminant" and the "most prevalent organic compound detected" at FS-28. Please clarify in text if there were other contaminants detected. If so, which ones and were any above risk-based levels?

Response: EDB was the only organic compound that exceeded risk levels. Other compounds included carbon tetrachloride. The levels of EDB found in the plume drive the removal action and therefore it is not necessary to discuss the other organic compounds detected since they are not risk drivers.

21. Page 1-8, § 1.8, ¶ 1 - The statement that "use of EDB-contaminated surface water and groundwater for agricultural purposes" is inaccurate. To be consistent with project purpose, change "use" to "exposure." If possible, summarize risk assessment findings from *Draft SWOU RI Report* here.

Response: ... the use of ... has been revised to " exposure to". This EE/CA document was issued at the same time as the Draft SWOU RI. For this reason, it is preferred to

wait until the comments on draft SWOU RI are resolved since there is a potential that the risk exposure scenerios and parameters may change between the draft and final version. The Action Memorandum will summarize the risk assessment since it will include a section on endangerment.

22. Page 1-8, § 1.9 - This section should probably be entitled "Other Ongoing Response Actions for the FS-28 Plume" since it describes actions that are in addition to those being evaluated in this report. The 3rd sentence in the 1st ¶ should state that the Draft RI Report **was released** on October 29th. In the next sentence, delete "will" and change "include" to "includes," "delineate" to "delineates," "discuss" to "discusses," and "present" to "presents." In the last sentence of the ¶, change "will also be" to "are also." In the 2nd ¶, rewrite the 2nd sentence to state: "The removal actions being proposed in this document will be consistent with any long-term remedial actions ultimately selected for the FS-28 plume."

Response: agreed.

23. Page 1-9, § 1.10 - The title of this section is awkward. It would be better entitled Additional Factors Supporting a Removal Action."

Response: agreed.

24. Page 2-2, § 2.2 - Add SWOU RI/FS to the list of ongoing actions.

Response: agreed.

25. Bottom of Page 3-4 and Top of Page 3-5 - Suggest removing and adding to fact sheet. See general comment 1.

Response: comment noted. See response to general comment 1.

26. Page 3-6, § 3.7.3 - Depending on the resolution of this, this section should be amended to reflect the regulatory authority which will govern the cleanup.

Response: comment noted. AFCEE has written a letter to resolve the regulatory authority.

27. Page 3-7 - 3-8, § 3.7.5 - EPA recommends that this section be deleted. It tends to confuse the reader rather than clarify because it does not explain how these statutes and regulations apply (if at all) to the removal actions under consideration. The ARARs description in § 3.7.4, however, should be expanded to describe the major statutes and regulations that are either applicable or relevant and appropriate to the alternatives being evaluated.

Response: Comment noted. Section will be deleted as recommended.

28. Page 5-1 - 5-16, § 5.0 through 5.6 - Line-by-line comments are not provided since this section is flawed in several major respects. See above general comment on Section 5. In addition, please note that a "No Action" alternative means **no action**. Delete "institutional controls." If institutional controls are being evaluated, the alternative is generally referred to as a "Limited Action" alternative.

Response: No action changed to Limited Action. See response to general comment 1.

29. Page 6-1 - 6-10, § 6.0 - 6.4 - See above general comment 1.

Response: Comment noted. See response to general comment 1.

30. Section 7.0 - Suggest moving section to Appendix.

Response: Comment noted. Section was important since this document will be utilized by different agencies.

31. Figure 3-1 - Delete Nora Conlon from Federal boxes.

Response: Agreed.

32. Figure 5-5 - a) Revise figure based on changes presented on site walk on November 8th (i.e., pipeline location).

Response: Agreed.

c) Lower Baptiste Bog - Describe berm to be built across the middle of bog. See general comment above on surface water extraction from Broad River.

Response: Agreed.

d) Augusta Bog - State contingency nature of reservoir for water storage.

Response: Agreed.

33. Figure 6-1 - Revise figure based on changes presented on site walk on November 8th (i.e., pipeline location).

Response: Agreed.

34. Figure 6-4 - Add height dimension for sheet piling (i.e., tie into existing bog, etc).

Response: Agreed.

35. Figure 7-1 through 7-7 - If monitoring section is moved to Appendices, then move figures as well.

Response: This document is being used to satisfy a variety of audiences, therefore it is important to have this as a major section.

36. Figure 7-4 - Additional water level locations may need to be added depending on whether or not surface water will be extracted from Broad River. As known, water levels in Broad River and vernal pool are an ecological impact concern.

Response: Extraction from Broad River is no longer being considered.

37. Section 404(b)(1) guidelines issues: Table 3-1 should include section 404 of the Clean Water Act as an ARAR under LOCATION-SPECIFIC REQUIREMENTS.

Response: agreed.

38. Table 3-2 needs an additional activity column describing the proposed withdrawal of surface water from the Broad River. This proposed activity may trigger the need for a CWA section 404 permit if any type of dredged or fill material will be discharged to the river or adjacent wetlands to place an intake structure for the withdrawal.

Response: Withdrawal from Broad River is no longer being considered.

39. Table 3-1 - Comments on this table are provided via a marked up copy.

Response: comment noted.

40. Table 5-1 - a) Consider adding footnote to alternatives B through E on the variability of real estate costs associated with losing bogs from production.

Response: comment noted.

b) Alternative D cost may be higher since bog area would be lost to production with construction of 20' wide berm. In addition, cost should also note the additional costs of providing water management system.

Response: comment noted. This cost may be hard to quantify since it relies on cooperation with the growers.

c) Alternative E - See above general comment on extraction of surface water from Broad River. Under advantages, add project objective, "reduce exposures to contaminated surface water and groundwater." Under features, revise text on construction of holding pond on Augusta bog pending decision to scale up to full-scale.

Response: agreed.

41. Tables 7-1 through 7-6 - If monitoring section is moved to Appendices, then move tables as well.

Response: Comment noted.

(intentionally blank)

DEP COMMENTS ON THE
DRAFT ENGINEERING EVALUATION, COST ANALYSIS, AND EXECUTION PLAN FOR COONAMESSETT RIVER FS-28 BOG SEPARATION PROJECT
Dated October 1998

GENERAL COMMENTS

1. Since April 1998, the Department has voiced concern that AFCEE has not determined the authority under which they propose to conduct the bog/river separation activities. This determination is needed in order to ensure that the work is completed in accordance with applicable regulations and with the appropriate permits. Recently, AFCEE has verbally stated that the activities are to be completed under CERCLA, but due to the CERCLA petroleum exclusion, AFCEE is still required to obtain any permits needed to complete the project (e.g. permits under the federal and state regulations). As such, the Department has determined that under the Section 10.53 of the Wetlands Protection act the activities to separate the bog/river fall under the Limited Project Status to remediate hazardous waste sites and will require a Notice of Intent (NOI) filing and an Order of Conditions. The Department wetlands staff will review and comment on the NOI received on November 2, 1998, which includes the Plan. However, comments from the Department Wetlands staff are not included in this letter. In order to alleviate confusion and expedite the review of the NOI and the Plan, the Department requests that AFCEE provide written documentation of the authority under which they intend to complete the bog/river separation project to both the Department and EPA as soon as possible.

   <u>Response:</u> **AFCEE will issue a letter to EPA and DEP which addresses the authority for the removal actions that are being undertaken.**

2. This Plan proposes environmental monitoring as described in Section 7.0, which as stated in the text, **"is fully described in the Draft Final FS-28 Monitoring Plan"**. The Department provided comments on this Draft Final FS-28 Monitoring Plan in August 1998, and has not received a response from the AFCEE. As such, the comments are repeated in this letter. Additionally, AFCEE recently verbally proposed some changes to the FS-28 ecological monitoring plan that are not reflected in the Plan. The Department is concerned that the Department's original comments have not been resolved, and that there is an inconsistent approach for environmental monitoring at FS-28. The Department recommends that the environmental monitoring for all aspects of the FS-28 plume be incorporated in one plan that includes both EW-1 and the bog/river separation project. As a final remedy for FS-28 is developed under the Southwest Operable Unit (SWOU) Feasibility Study (FS), the monitoring plan may be revised as needed.

   <u>Response:</u> **AFCEE is preparing comments to the above mentioned document and intends to resolve the comments on the FS-28 monitoring plan concurrent with this document. It is likely that the monitoring plan will require further modification to include the EW-1 and Bog/Separation Project. A meeting will be held between DEP, EPA and AFCEE to develop a comprehensive plan. This**

plan will be provided in the Action Memorandum. No modifications other than those that have been agreed will be included in the final EE/CA.

3. At the site visit on November 8, 1998, AFCEE stated that there are a number of changes to the Plan including a location change for the expanded treatment plant, and change in the location of well point discharge pipe. Please provide updated figures as Plan Sheets to allow for sufficient review.

   Response: Agreed. Plan sheets to be issued no later than November 27, 1998. DEP will receive two sets of the full size plan sheets for their review and comment.

PAGE-SPECIFIC COMMENTS

1. Executive Summary, Page ES-1. The text states that **"As part of its Plume Response Program the Air Force Center for Environmental Excellence has proposed a remedial action on the Coonamessett River..."** For all plumes under the Plume Response Program, AFCEE has followed the Decision Criteria Matrix (DCM) for selecting a remedial alternative. Please clarify if AFCEE intends to follow the DCM for the bog/river separation project.

   Response: **The DCM will not be utilized on this project. Remedial action is being changed to removal action as suggested by EPA.**

2. Executive Summary, Proposed Action, Page ES-1. The text states the proposed remedy **"involves supplying alternative sources of water to all upper bogs"**. It is the Department's understanding that this alternative water is to be provided for flooding and harvesting, and not irrigation. Please clarify. Further, the text states that the treatment plant may need to be expanded **"to effectively reduce concentrations of EDB entering Pond 14"**. As stated by the Department on several occasions, it is the Department's understanding that the goal should be to effectively reduce concentrations of EDB leaving the Baptiste bogs to non-detect. Please modify the text throughout the Plan to incorporate this goal.

   Response: **Alternative water is not provided for irrigation. Last sentence modified to say ....to effectively reduce the concentrations of EDB in the river system".**

3. Executive Summary, Alternative Water, Page ES-2. AFCEE proposes to use the treated water from the EW-1 treatment plant as the alternative water source for flooding for the bogs. Please verify that there will be sufficient volume for this use.

<u>Response:</u> **The following parapraph will be added to this section. "At the current discharge rate (600gpm) the bogs will require approximately nine days to have two feet over the vines. If the treatment plant were expanded the discharge rate would be approximately 1400 gpm and the time decreases to 4 days. The bog growers have indicated that 3 to 4 days is acceptable to fill the bogs. If the treatment plant is not expanded, a holding pond would be constructed on the Augusta bog to maintain the time to approximately 4 days. Water in the holding pond would be stockpiled as needed and used to fill the Augusta and West Thompson bogs."**

4. <u>Executive Summary, Active Treatment, Page ES-2.</u> AFCEE proposes that the active treatment may entail extracting and treating surface water from Broad River. The Department is concerned that there are many uncertainties associated with the extraction and treatment of surface water, including the potential ecological impacts on the wetlands, the impacts on the water quality of both the Broad and Coonamessett Rivers and the effect on the plume. As an alternative to surface water treatment, the Department recommends evaluating the expansion of the shallow well-point system. It is the Department" understanding that the shallow well-point pilot test was completed during the week of November 11, 1998, and these results will be used to determine if additional extraction is needed.

   <u>Response:</u> **Extraction and treatment of surface water from Broad River is no longer being considered in the alternatives.**

5. <u>Section 1.1 Introduction, Page 1-1.</u> As stated, **"the cranberry growers depend upon water from the river for irrigation..."**. It is the Department's understanding that AFCEE installed irrigation wells as alternative water sources for all the bogs with the exception of the Augusta bog, which utilizes a reservoir for irrigation. Therefore the river is no longer used for irrigation. Please verify and modify the text.

   <u>Response:</u> **Irrigation has been removed from the sentence.**

6. <u>Section 1.3 Project Objectives, Page 1-2.</u> To be consistent with goals of the MMR project, the first objective should be revised to state that **"if technically and economically feasible, protect human health by reducing concentrations of EDB to non-detect, in surface water and groundwater within the project area"**. It is not the goal to reduce concentrations to the MCL. Please revise the text. Also, as stated, the third goal includes providing a source of non-contaminated water for irrigation. It is the Department's understanding that AFCEE installed irrigation wells as alternative water sources for the bogs, and implemented actions to prohibit the Coonamessett River from coming in contact with the Augusta reservoir. Therefore new sources of irrigation water are not needed. Please verify and modify the text accordingly.

Response: Sentence to be modified to indicate non-detect in surface water. Groundwater was deleted from the sentence. In addition, the word irrigation was removed from the third sentence.

7. Section 1.6.2 Area Extent of FS-28 Plume, Page 1-5. As stated the **"...EDB upwells in the upper part of the Lower Baptiste cranberry bogs..."**. It is the Department's understanding that the EDB also upwells into the Broad River, while the remaining portion of the plume remains at depth in the aquifer north of Thomas B. Landers Road. Please modify the text accordingly.

   Response: Sentence to be modified as suggested.

8. Section 1.9 Proposed Response Actions – RI/FS Summary, Page 1-8. The AFCEE includes a summary of the potential extraction well options evaluated as part to the FS-28 EW-1 Evaluation Report Time Critical Response Action. To clarify, these extractions well options were evaluated as possible interim actions before the final remedy was selected. Further, while the data indicate that the EW-1 extraction well is capturing the majority of the plume, a portion of the plume continues to flow past the extraction well. The leading edge of the plume, as well as some segment of the eastern portion of the plume are not captured by the EW-1 extraction system. It is the Department's understanding that the FS will evaluate a final remedy for the leading edge of the FS-28 plume to address the uncaptured portions of the plume.

   Response: The FS will evaluate the final remedy for the plume. However it is not likely that separate alternatives will be considered for the deeper portion of the plume located north of Thomas B. Landers. Additional drilling and sampling is currently being conducted to further characterize this portion of the plume. It is anticipated that the shallow well point system will capture and intercept that portion of the EDB plume that is not being captured by the EW-1 extraction system.

9. Section 1.10 Final Note: Expected Change In Situation If Noting Is Done To Mitigate EDB Contamination, Page 1-9. In the second paragraph, AFCEE includes statements about the active treatment at the Coonamessett Water Supply Well (CWSW). Please clarify how the continued treatment at the CWSW is part of the bog/river separation project. It has been the Department's understanding since the treatment was activated (July 1996), that the treatment would continue until the aquifer was restored.

   Response: Sentences dealing with the CWSW will be removed from the document. These are not part of the bog separation project.

**DEP COMMENTS ON THE
DRAFT ENGINEERING EVALUATION, COST ANALYSIS, AND EXECUTION PLAN FOR COONAMESSETT RIVER FS-28 BOG SEPARATION PROJECT
Dated October 1998**

10. Section 2.1 Summary Of Previous Actions, Page 2-1. In the sixth bullet, AFCEE describes the air sampling conducted at Broad River. However, air sampling was also conducted at the Reservoir bog area. Please include these air sampling activities in the summary.

    Response: Agreed.

11. Section 2.2 Summary Of Ongoing Actions Page 2-2. Third bullet: To clarify, the AFCEE selected the analytical laboratory for cranberry analysis. Please modify the text. Also, please include a description of the ongoing EW-1 extraction, treatment and discharge.

    Response: Agreed.

12. Section 4.2 River Flow Characteristics, Page 4-2. In this section, AFCEE describes the flooding of the Baptiste E3, Adams, LaSalle, and East Thompson bogs. Please also include a description of the Baptiste E4 bog, and modify the Figure 4-1.

    Response: Agreed.

    Section 4-4 Ecological Setting, Pages 4-3 through 4-7. As stated, the Coonamessett River is a source of irrigation water for the cranberry bogs. It is the Department's understanding that AFCEE installed irrigation wells as alternative water sources for all the bogs with the exception of the Augusta bog, which utilizes a reservoir for irrigation. Therefore the river is no longer used for irrigation. Please modify the text. Also, given that the Coonamessett River flows from Pond 14 to Flax Pond and that there are cranberry bogs located along the Flax Pond outlet stream which connects to the Coonamessett River near Middle bog, please update this Section to include the Flax Pond area.

    Response: Irrigation deleted from the sentence. Coonamessett River does not flow to Flax Pond. There is a man-made channel that provides water from Pond 14 to Flax Pond. The Flax pond bogs are not affected by the contamination in the Coonamessett River system. Sampling is being done to verify that this statement is correct. Additional paragraph will be added at the end of Section 4.2 to discuss the relationship between Pond 14 and Flax pond. Flax pond bogs are not affected by the contamination.

13. Section 5.6 Alternative E: Phased Approach – Preferred Alternative, Page 5-12. It is the Department's understanding that the alternative involves providing alternative water for flooding the bogs; separating the river from the bogs including Baptists E3, Adams, LaSalle, Augusta (closing off culvert to the Coonamessett River), and East

Thompson; and active groundwater treatment. Please modify the text. Further, it is the Department's understanding that the goal should be to effectively reduce concentrations of EDB leaving the Baptiste bogs to no-detect, not just to reduce concentrations of EDB leaving Pond 14 to non-detect. Please modify the text throughout the Plan to incorporate this goal.

Response: **First sentence to be modified as suggested. This alternative cannot achieve the goal of non-detect without removing and treating substantial volumes of water. This withdrawal may cause acceptable environmental impact. Thus, it is not technically or economically feasible to achieve the goal. The text does not say anything about the goal, it only states what is feasible to achieve. No change is recommended.**

14. Section 5.6.1. Alternative Source of Water, Second Paragraph, Page 5-13. It is the Department's understanding that the reservoir may not be needed if there is sufficient volume from the effluent of the EW-1 treatment plant and the shallow well-point system. As stated in the Plan, this combined volume could include up to 800 gpm from EW-1, and up to 1,000 gpm from the shallow-well points for a total of 1,800 gpm for discharge. Please verify and modify the text and the third bullet accordingly.

Response: **Agreed.**

15. Section 5.6.2 Separate Active Bogs from River Using Berms or Vinyl Sheet Piles, Pages 5-14 and 5-15. Based on discussions at the November 8, 1998 site visit, it is the Department's understanding that vinyl sheet piles are now proposed for the Adams and LaSalle bogs. Further, the construction for the berm proposed for the East Thompson bog could help prevent flooding of abutter property. Please verify, and modify the text accordingly. Also, please discuss any disadvantages that the vinyl sheet piles may have on the hydraulics of the river system.

Response: **Vinyl sheets are still being maintained as a option. They have no effect on the river hydraulics since they will be located within the bog channels and thus away from the active river. A cuttoff wall (for example sand bags) may be required where the bog channels and the river are in close proximity. The sand bags will keep the river from following the bog channel and the newly installed sheet pile wall. Vinyl sheets are added to Section 6.0 for the Adams and Lasalle bogs.**

16. Section 5.6.3 Active Treatment to Reduce EDB Levels in the River, Pages 5-15 and 5-16. As stated on several occasions, it is the Department's understanding that the goal of active treatment should be to effectively reduce concentrations of EDB leaving the Baptiste bogs to non-detect, not just to reduce concentrations of EDB

leaving Pond 14 to non detect. Please modify the text and tables throughout the Plan to incorporate this goal.

Further, AFCEE proposes that the active treatment may entail extracting and treating surface water from Broad River. The Department is concerned that there are many uncertainties associated with the extraction and treatment of surface water, including the potential ecological impacts on the wetlands, the impacts on the water quality of both the Broad and Coonamessett Rivers and the effect on the plume. As an alternative to surface water treatment the Department recommends evaluating the expansion of the shallow well-point system. Also, please provide discussion of the impacts on the plume of reducing the EW-1 pump rate to 400 gpm from the current 600 gpm. It is the Department's understanding that the shallow well-point pilot test was completed during the week of November 11, 1998 and these results will be used to determine if additional extraction is needed. Please modify this section and associated tables accordingly.

<u>Response:</u> **Comment noted. Withdrawal from Broad River is no longer being considered and has been removed from the alternatives.**

17. <u>Section 6.0 Construction Plan – Preferred Alternative, Pages 6-1 through 6-10.</u> Please update this section accordingly based on the revised goal (EDB to non-detect at the outlet form the Baptiste bogs), the recommendation to expand the shallow well-point system instead of surface water treatment and the result of the shallow well-point pilot test. Also, AFCEE should implement erosion control and silt control measures when installing any additional shallow well-points.

<u>Response:</u> **Comment noted.**

18. <u>Section 6.4 Schedule, Page 6-10, and Figure 6-5.</u> Before the plan was submitted for regulatory review, the AFCEE agree to modify the schedule to include several public involvement meetings, etc. which were requested by the regulatory agencies. However, the schedule in the Plan does not reflect these changes. Additionally, the schedule inaccurately depicts the Pond 14 clearing and tracer test beginning on October 27, 1998 when in fact the work has not yet started. Please provide an updated schedule that includes all the agreed upon changes. Also, given the rapid schedule of activities, the Department requests that the schedule be updated as necessary and provided to the regulatory agencies.

<u>Response:</u> **Agreed.**

19. Section 7.0 Environmental Monitoring, Pages 7-1 through 7-6. Please refer to the Department's General Comment No. 2. Also, Tables 7-1, 7-3, and 7-6 should be revised once there is consensus on the FS-28 Monitoring Plan.

    Response: Agreed.

20. Section 7.1 Surface Water Sampling Page 7-1. Please include the surface water decision tree referenced in this paragraph.

    It is the Department's understanding that the criteria for marketability of cranberries is one year of EDB-free surface water (where not detect (ND) is <0.005 μg/L). Implicit in this criteria is the understanding that the surface water sampling frequency must be sufficient to support these findings. It is the Department's understanding that the inflow and outflows should be sampled monthly all year and at harvest to support the criteria. At this time, the Department does not support reducing the sampling to quarterly after three months of not-detect. Please modify the text.

    Response: Agreed. Last three sentences will be deleted from the text.

21. Section 7.2 Air Sampling, Page 7-2. It is the Department's understanding that the agreement from the September 1997 meeting among AFCEE, EPA, Massachusetts Department of Public Health and the Department was that if EDB was detected in surface water at or above 0.5 μg/L, then AFCEE would immediately resample the surface water and collect air samples according to past protocol. Please verify, and provide the additional information on the air sampling protocol such as number of samples, number of locations (upwind, downwind, crosswind), etc.

    Response: The following text will be added. "If the river surface water is found greater than 0.5 ug/L, AFCEE will resample the river surface water, and collect air samples just above the surface water, down wind and at an upwind locations. Air samples will be collected over a eight hour period and tested in accordance with the accepted protocol and standard operating procedures."

22. Section 7.3 Groundwater Sampling, Page 7-2. Please include the decision tree referenced in this paragraph.

    Response: agreed.

23. Section 7.4 Ecological Monitoring, Page 7-2. The Ecological Monitoring plan does not appear to be entirely consistent with the Work Plan for The Ecological Assessment Associated with Groundwater Plumes and Remedial Activities (1998) (the "Workplan"). The Department recommends that AFCEE meet with the

regulatory agencies to resolve the consistency issues (candidate reference areas. Assessment endpoints and measure of effect, chemical and physicochemical parameters (Table 4-1), etc.). Also, the Department recommends that the Flax Pond area be included in the ecological monitoring. Additionally, please refer to the Department's General Comment No. 2.

<u>Response:</u> **Concur.**

24. <u>Section 7.4.6 Biological Sampling, Page 7-5.</u> The Department does not agree that "conducting amphibian surveys after groundwater treatment system start-up without baseline data for comparison would be of limited value: therefore amphibian surveys will not be conducted". Given the direct discharge of treated water the surface water and the potential impacts to adjacent wetlands and the vernal pool, and the 1998 amphibian season, the Department recommends that AFCEE conduct these surveys as soon as possible so as to collect adequate data. Delay is not acceptable justification. Since AFCEE did not respond to the Department's comments in August 1998, the 1998 amphibian season has past without a survey. The Department recommends that AFCEE conduct this survey as soon as possible in 1999.

    <u>Response:</u> **Agreed. Sentence to be revised to indicate that amphibian survey to be conducted in the spring of 1999.**

25. <u>Section 7.5 Reporting, Page 7-6.</u> The Report states that **"A technical report will be prepared each quarter".** However, since the system start-up in October 1997, AFCEE has issued only the EW-1 evaluation Report, which included some ecological data from 1997, but no interpretation. AFCEE has continued the monitoring throughout 1998, but has not issued any reports presenting and evaluating data. The Department requests that quarterly technical report(s) be submitted to the regulatory agencies evaluating all the aspects of the environmental monitoring program including EW-1 performance, ecological impact, surface water, groundwater, air, and the bog/river separation project performance. Please note that in accordance with the Work Plan for the Ecological Assessment Associated with Groundwater Plumes and Remedial Activities (1998), AFCEE is required to present in the quarterly report a screening-level human health and ecological risk evaluation based on the data collected during the quarter. Further, the annual report should focus on 1) describing existing conditions and seasonal variations at potentially impacted sites and candidate reference areas, and 2) comparing potentially impacted sites to their associated candidate reference area(s).

    Additionally, despite repeated requests by the Department, the AFCEE has yet to provide an Operation and Maintenance plan for the EW-1 treatment plant, which should include reporting requirements for the treatment plan performance. Please

provide these reports as soon as possible and modify the schedule to include the report submittals for 1999.

Response: **Agreed. A quarterly report for FS-28 is being prepared and should be released in December, 1998. The O&M plan has not been finalized since the plant is operating on interim status. However, AFCEE will include these report submittals for 1999.**

26. Section 8.2.3. Local Stakeholders, Page 8-3. Please discuss the specific community involvement activities proposed for this Plan.

Response: **Comment noted.**

27. Figures 1-3, 1-4, and 1-5. In some instances, surface water data are not reported after July 1998. Please provide a justification in a footnote or text for this change in monitoring. Also, please include location 69SW0061.

Response: **July data is provided. In some instances there were two rounds that were completed due to the holidays. Thus, the June sampling event was conducted near the first week of July and the July event was conducted near the later part of the month. 69SW0061 is no longer being sampled. Data is currently being collected from 69SW0060 which is representative of the water in the return reservoir and effluent from the bog. The return reservoir has remained disconnected from the river.**

28. Figure 6-1 and Appendix C, Sheet 2. At the bog site visit on November 8, 1998, the AFCEE stated a number of changes to the proposed plans as detailed in these figures including: a location change for the expanded treatment plant and change in the location of well point discharge pipe. Please provide updated figures as Plan Sheets to allow for sufficient review.

Response: **Agreed.**

29. Figure 6-4. At the bog site visit on November 8, 1998, the AFCEE indicated their preference for installing vinyl sheet piles in the bog ditch to separate the bog from the river. Please provide an updated figure of the sheet pile details.

Response: **Agreed.**

30. Figure 7-1. Previously, in the draft FS-28 Monitoring Plan dated 1997, monitoring well MW1289 was included in the quarterly monitoring. Please include or justify the

modification. Note that this comment was also included in the Department's letter dated August 20, 1998 which provided comments on the Draft Final FS-28 Environmental Monitoring Plan dated 1998. The AFCEE has not responded to these comments, so they are therefore repeated here for completeness.

<u>Response:</u> **69MW1289 is not being sampled since the borewater data collected at the time of installation did not detect any contamination. We believe that the well is located to close to Broad River and may be within a stagnation point.**

31. <u>Figure 7-4.</u> Previously, in the draft FS-28 Monitoring Plan dated 1997, monitoring wells MW1285, MW1291, and MW1289 were included in the water level monitoring locations. Please include or justify the modification. Note that this comment was also included in the Department's letter dated August 20, 1998 which provided comments on the Draft Final FS-28 Environmental Monitoring Plan dated 1998. The AFCEE has not responded to these comments so they are therefore repeated here for completeness.

<u>Response:</u> **Comment noted. These are currently being measured for water levels. The table will be revised.**

32. <u>Table 1-1, Potentially Affected Bogs on the Coonamessett River Table 7-2, Surface Water Sampling Location by Bog.</u> The tables contain a number of issues that should be clarified. The Upper Baptiste bog (E3) had EDB detected in the surface water at station SW0008, and the Chaston bog (J) had EDB detected in the surface water at station SW2006. However, in the tables, both of the bogs are listed as being isolated from the river. The Augusta bogs (G1 and G2) are listed as being isolated from the river, but in 5.6.1.1 the text states that the AFCEE intends to "**remove the two weirs from Augusta bog to remove the river as a source for bog flooding**". The LaSalle bog (H) was recently constructed in 1997, yet the tables indicate that it was active in 1996. Also, the LaSalle bog is listed as being isolated from the river, yet the AFCEE intends to install berms or vinyl sheet piles in order to separate the river from the bog. Finally, the Flax bog (D2) is listed as not being potentially affected by EDB, and as being isolated from the river. However, the river does flow to Flax Pond and the outlet from Flax Pond flows through the Flax Pond bogs, and the surface water from Flax Pond is used to irrigate the Flax Pond bogs. Please clarify these issues and modify the tables as necessary.

<u>Response:</u> **E3 detections resulted from flooding of Broad River, the bog is not isolated or separated from Broad River. Weirs are being removed at the request of the bog growers, AFCEE does not feel that the weirs need to be removed to demostrate that surface water in the bogs does not have detectable levels of EDB. The Lasalle bog must have been active in 1996 or it would have required a more**

extensive permit application to reactive and bring back into production. The Flax pond bogs are not connected to the Coonamessett River system.

33. Table 3-1, ARARs, Criteria and Guidance for FS-28 Removal Actions. The table contains a number of issues that should be clarified. To be consistent with the MMR project, the goal for any action, whether to met the Massachusetts Drinking Water Regulations, Groundwater Quality Standards, or Surface Water Quality Standards, is to treat to non-detect if technically and economically feasible. Please modify the table.

    Also, AFCEE has verbally stated that the activities are to be completed under CERCLA, but due to the CERCLA petroleum exclusion. AFCEE is still required to obtain any permits needed to complete the project (e.g. permits under the federal and state regulations). As such, the Department has determined that under the Section 10.53 of the Wetlands Protection Act, the activities to separate the bog/river fall under the Limited Project Status to remediate hazardous waste sites and will require a Notice of Intent (NOI) filing and an Order of Conditions. Please modify the table accordingly.

    Response: Comment noted. Table will be modified to reflect a limited Project Status.

34. Table 3-2, Summary of Regulatory Criteria and Required Environmental Permits. AFCEE has verbally stated that the activities are to be completed under CERCLA, but due to the CERCLA petroleum exclusion, AFCEE is still required to obtain any permits needed to complete the project (e.g. permits under the federal and state regulations). As such, the Department has determined that under the Section 10.53 of the Wetlands Protection Act, the activities to separate the bog/river fall under the Limited Project Status to remediate hazardous waste sites and will require a Notice of Intent (NOI) filing and an Order of Conditions. Please modify the table accordingly. Also, please include the required permits for the proposed fish ladders downgradient of Pond 14.

    Response: Comment noted. Table will be modified to reflect a limited Project Status.

JACOBS ENGINEERING
Engineers and Constructors

Jacobs Engineering Group Inc.
Building 318, 318 East Inner Road
Otis ANG Base, Massachusetts 02542
508•564•5746 Fax 508•564•6425

November 30, 1998

Mr. Jim F. Snyder
Remediation Program Manager
HQ AFCEE/MMR
322 East Inner Road, Box 41
Otis ANG Base, MA 02542-5028

RE: Final Engineering Evaluation, Cost Analysis, and Execution Plan for Coonamessett River Bog Separation Project, Contract F41624-97-D-8006, Delivery Order 03

Dear Mr. Snyder:

As directed by the Air Force Center for Environmental Excellence, Jacobs Engineering Group Inc. is hereby providing twenty-two bound copies, one unbound copy, and 1 electronic copy of the *Final Engineering Evaluation, Cost Analysis, and Execution Plan for Coonamessett River Bog Separation Project*, dated November 1998. Copies are also being sent to the appropriate agencies.

Please feel free to contact me or John Gadd at (508) 564-5746 extension 361, if you have any questions or comments.

Sincerely,

Eric W. Banks, P. E.
Program Manager

Enclosures: Document (23 & 1 EDD)

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Document Control Number: AFC-J23-35Q85009-M1-0004

JACOBS ENGINEERING GROUP INC.

cc:

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DEP:
  Lynne Doty (1)
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ARE:
  Jo Ann Watson (1)
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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE
INSTALLATION RESTORATION PROGRAM
OTIS AIR NATIONAL GUARD BASE, MA 02542-5028

1 Dec 1998

MEMORANDUM FOR SAF/LLP
ATTENTION: MS CHARLOTTE MOYER

FROM: HQ AFCEE/MMR
322 East Inner Road, Box 41
Otis ANG Base, MA 02542-5028

SUBJECT: Final Report

1. Please be advised that the "Final Engineering Evaluation, Cost Analysis, and Execution Plan for Coonamessett River FS-28 Bog Separation Project" dated November 1998 has been issued as a Final Document.

2. If you have any questions, please call Nancy Balkus at (508) 968-4670, extension 4676.

JIM F. SNYDER
Remediation Program Manager

cc:
Nancy Balkus (w/o atch)
David Taylor (w/o atch)

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE
INSTALLATION RESTORATION PROGRAM
OTIS AIR NATIONAL GUARD BASE, MA 02542-5028

1 Dec 1998

MEMORANDUM FOR AFCEE/ERC
ATTENTION: MS. BARBARA SMITH-TOWNSEND

FROM: HQ AFCEE/MMR
322 East Inner Road, Box 41
Otis ANG Base, MA 02542-5028

SUBJECT: Final Document

1. Attached please find (3) three copies of the "Final Engineering Evaluation, Cost Analysis, and Execution Plan for Coonamessett River FS-28 Bog Separation Project" dated November 1998

2. If you have any questions, please call Nancy Balkus at (508) 968-4670, extension 4676.

JIM F. SNYDER
Remediation Program Manager

Attachment:
Document (3 copies)

cc:
Nancy Balkus (w/o atch)
David Taylor (w/o atch)

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Expires Mar 31,1993

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HQ AFCEE/MMR, Installation Restoration Program
322 East Inner Road
Otis ANG Base, MA 02542-5028

SHEET NO.: 1
NO. OF SHEETS: 1
5. REQUISITION DATE (YY-MM-DD): 98 12 02
6. REQUISITION NUMBER:
7. DATE MATERIAL REQUIRED(YY-MM-DD): 98 12 03
8. PRIORITY:

2. TO (Include ZIP Code)
AFCEE/ERC
3207 North Road
Brooks AFB, TX 78235-5361

9. AUTHORITY OR PURPOSE:
10. SIGNATURE: Beverly Connolly
11a VOUCHER NUMBER & DATE (YY-MM-DD): B. CONNOLLY, 98 12 02

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15 AIR MOVEMENT DESIGNATOR OR PORT REFERENCE NO.:

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ITEM NO. (a)	FEDERAL STOCK NUMBER, DESCRIPTION, AND CODING OF MATERIEL AND / OR SERVICES (b)	UNIT OF ISSUE (c)	QUANTITY REQUESTED (d)	SUPPLY ACTION (e)	TYPE CONTAINER (f)	CONTAINER NOS. (g)	UNIT PRICE (h)	TOTAL COST (i)
	Final Documents							

16 TRANSPORTATION VIA MATS OR MSTS CHARGEABLE TO

17. SPECIAL HANDLING

18. RECAPITULATION OF SHIPMENT	TOTAL CONTAINERS	TYPE CONTAINER	DESCRIPTION	TOTAL WEIGHT	TOTAL CUBE
ISSUED BY Beverly Connolly					
CHECKED BY					
PACKED BY					
			← TOTAL →		

19. RECEIPT	DATE(YYMMDD)	BY	
CONTAINERS RECEIVED EXCEPT AS NOTED			SHEET TOTAL
QUANTITIES RECEIVED EXCEPT AS NOTED			GRAND TOTAL
POSTED			20 RECEIVER'S VOUCHER NO.

DD Form ..., JAN 93 (EF) 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 6... ...9 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 ... 97 98 99 100

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE
INSTALLATION RESTORATION PROGRAM
OTIS AIR NATIONAL GUARD BASE, MA 02542-5028

1 Dec 1998

MEMORANDUM FOR AFCEE/JA
ATTENTION: MR. WILLIAM DICK

FROM: HQ AFCEE/MMR
322 East Inner Road, Box 41
Otis ANG Base, MA 02542-5028

SUBJECT: Final Document

1. Attached please find a copy of the document entitled "Final Engineering Evaluation, Cost Analysis, and Execution Evaluation Plan for Coonamessett River FS-28 Bog Separation Project" dated November 1998

2. If you have any questions, please call Nancy Balkus at (508) 968-4670, extension 4676.

JIM F. SNYDER
Remediation Program Manager

Attachment:
Document (one copy)

cc:
Nancy Balkus (w/o atch)
David Taylor (w/o atch)

SHIPPING CONTAINER TALLY → 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

REQUISITION AND INVOICE / SHIPPING DOCUMENT

Form Approved
OMB No. 0704-0246
Expires Mar 31,1993

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO EITHER OF THERE ADDRESSES. RETURN COMPLETED FORM TO THE ADDRESS IN LINE 2.

1. FROM: (Include ZIP Code)
HQ AFCEE/MMR, Installation Restoration Program
322 East Inner Road
Otis ANG Base, MA 02542-5028

SHEET NO.: 1
NO. OF SHEETS: 1
5. REQUISITION DATE (YY-MM-DD): 98 12 02
6. REQUISITION NUMBER
7. DATE MATERIAL REQUIRED(YY-MM-): 98 12 03
8. PRIORITY

2. TO (Include ZIP Code)
AFCEE/JA
3207 North Road
Brooks AFB, TX 78235-5361

9. AUTHORITY OR PURPOSE
10. SIGNATURE: Beverly Connolly
11a VOUCHER NUMBER & DATE (YY-MM-DD): B. CONNOLLY, 98 12 02

SHIP TO MARK FOR: ATTN: MR. WILLIAM DICK

12. DATE SHIPPED (YYMMDD): 98 12 02
B: 4670, ext. 4685
13. MODE OF SHIPMENT: FEDEX
14 BILL OF LADING NUMBER
15 AIR MOVEMENT DESIGNATOR OR PORT REFERENCE NO.

4. APPROPRIATIONS SYMBOL AND SUBHEAD	OBJECT CLASS	EXPENDITURE ACCOUNT (From)	(To)	CHARGEABLE ACTIVITY	BUREAU CONTROL ACTIVITY NO.	BUREAU CONTROL NO.	AMOUNT

ITEM NO. (a)	FEDERAL STOCK NUMBER, DESCRIPTION, AND CODING OF MATERIEL AND / OR SERVICES (b)	UNIT OF ISSUE (c)	QUANTITY REQUESTED (d)	SUPPLY ACTION (e)	TYPE CON-TAINER (f)	CON-TAINER NOS. (g)	UNIT PRICE (h)	TOTAL COST (i)
	Final Document							

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18. RECAPITULATION OF SHIPMENT	TOTAL CON-TAINERS	TYPE CON-TAINER	DESCRIPTION	TOTAL WEIGHT	TOTAL CUBE
ISSUED BY: B. Connolly					
CHECKED BY					
PACKED BY					
			← TOTAL →		

19. RECEIPT		DATE(YYMMDD)	BY	
CONTAINERS RECEIVED EXCEPT AS NOTED				SHEET TOTAL
QUANTITIES RECEIVED EXCEPT AS NOTED				GRAND TOTAL
POSTED				20 RECEIVER'S VOUCHER NO.

DD Form JAN 93 (EF) 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 9 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 97 98 99 100

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE
INSTALLATION RESTORATION PROGRAM
OTIS AIR NATIONAL GUARD BASE, MA 02542-5028

1 Dec 1998

MEMORANDUM FOR NGB-PAI-E
ATTENTION: MR. JOHN REINDERS

FROM: HQ AFCEE/MMR
322 East Inner Road, Box 41
Otis ANG Base, MA 02542-5028

SUBJECT: Final Document

1. Attached please find a copy of the document entitled "Final Engineering Evaluation, Cost Analysis, and Execution Plan for Coonamessett River FS-28 Bog Separation Project" dated November 1998.

2. If you have any questions, please call Nancy Balkus at (508) 968-4670, extension 4676.

JIM F. SNYDER
Remediation Program Manager

Attachment:
Document (one copy)

cc:
Nancy Balkus (w/o atch)
David Taylor (w/o atch)

SHIPPING CONTAINER TALLY → 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

REQUISITION AND INVOICE / SHIPPING DOCUMENT

Form Approved
OMB No. 0704-0246
Expires Mar 31,1993

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO EITHER OF THERE ADDRESSES. RETURN COMPLETED FORM TO THE ADDRESS IN LINE 2.

1. FROM: (Include ZIP Code) HQ AFCEE/MMR, Installation Restoration Program
322 East Inner Road
Otis ANG Base, MA 02542-5028

2. TO (Include ZIP Code) NGB-PAI-E
Park Center Four, Suite 450
4501 Ford Avenue
Alexandria, VA 22303-1454

SHIP TO MARK FOR ATTN: MR. JOHN REINDERS

SHEET NO.	NO. OF SHEETS	5. REQUISITION DATE (YY-MM-DD)	6. REQUISITION NUMBER
1	1	98 12 02	

7. DATE MATERIAL REQUIRED(YY-MM-DD): 98 12 03

8. PRIORITY

9. AUTHORITY OR PURPOSE

10. SIGNATURE: Beverly Connolly

11a VOUCHER NUMBER & DATE (YY-MM-DD): B. CONNOLLY, 98 12 02

12. DATE SHIPPED (YYMMDD): 98 12 02

B: 4670, ext. 4685

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	Final Document							

16 TRANSPORTATION VIA MATS OR MSTS CHARGEABLE TO

17. SPECIAL HANDLING

18. RECAPITULATION OF SHIPMENT

	TOTAL CON-TAINERS	TYPE CON-TAINER	DESCRIPTION	TOTAL WEIGHT	TOTAL CUBE
ISSUED BY Beverly Connolly					
CHECKED BY					
PACKED BY					
			← TOTAL →		

19. RECEIPT

	DATE(YYMMDD)	BY	
CONTAINERS RECEIVED EXCEPT AS NOTED			SHEET TOTAL
QUANTITIES RECEIVED EXCEPT AS NOTED			GRAND TOTAL
POSTED			20 RECEIVER'S VOUCHER NO.

DD Form JAN 93 (EF) 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 6 9 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 97 98 99 100